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FLIGHT

and The AIRCRAFT ENGINEER

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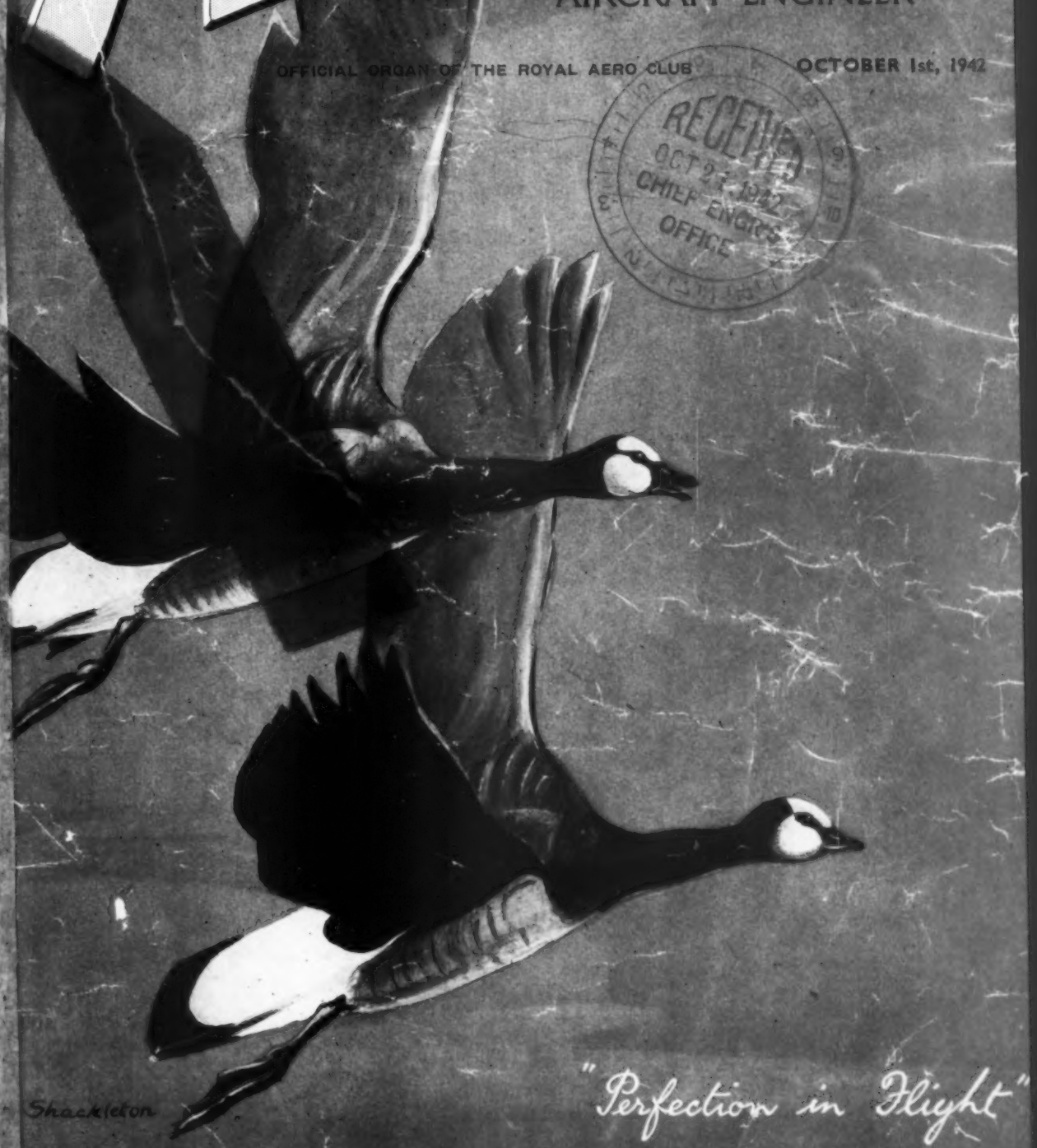

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FLIGHT and The AIRCRAFT ENGINEER

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C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

Chief Photographer
JOHN YOXALL

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The Outlook

Proper Perspective

FROM its inception in 1909 it has been the policy of this journal to give credit where credit is due, irrespective of other considerations. The founder of *Flight* made that a cardinal rule, and during the intervening years we have been gratified by the accumulated evidence of a reputation for fairness in our comment on and treatment of aviation subjects.

As part of that set policy we have endeavoured to deal fairly with the products of American aircraft and aircraft engine manufacturers, and we have received from these manufacturers many letters of appreciation of the unbiased way in which we have placed before our readers illustrations, data and comments whenever a new American type appeared to merit inclusion in our pages.

In view of this admitted fact we shall not, we hope, be accused of any bias against American products when we publish in this issue excerpts from an article by Major Alexander Seversky, in which he "debunks" the extravagant claims made for American aircraft by large numbers of American writers. We have, in our pages, frequently deprecated this habit of over-statement. They are unconvincing and misleading, and in the long run they do more harm than good to the cause which they profess to champion.

American aircraft, no less than American production methods, are good enough to stand on their merits without any artificial bolstering. To claim that they are, without exception, world-beaters is merely childish and does not, of course, deceive the enemy in the least. American aircraft shares with the aircraft of all nations the handicap of having to be compromises; sometimes the designer has struck a compromise which produced the best possible weighing-up of conflicting claims, and the result is a type which proves outstanding in its class.

By concentrating on one particular feature and sacrificing other qualities it is possible to obtain remarkable results, but it depends entirely on the operational requirements of the particular type whether or not the sacrifice has been worth while.

Power "Eggs"

QUITE early in the war we commented in these pages on the slow progress being made with "implementing" (horrid Parliamentary word) the recommendations of a special committee of the S.B.A.C. on power plant units. The Society of British Aircraft Constructors had realised for a long time the very great advantages which would accrue if agreement could be reached concerning the standardisation of certain classes of engine installation.

For a time progress was slow, as was, perhaps, to be expected in view of the difficulties which undeniably existed. However, the champions of the scheme persevered, and that their labours have borne good fruit is now evident from a survey of numerous aircraft types in the R.A.F. Not only does one find identical engine units in dissimilar aircraft types, but there are quite a few instances of a change having been made from liquid-cooled to air-cooled engines and vice versa.

The beneficial effect of this power plant standardisation is reflected in many directions, and the engine firms deserve great credit for their foresight and perseverance, often in the face of considerable opposition. A good many years ago at least two engine manufacturers acquired aircraft for the express purpose of having "flying test beds" on which to carry out development work. There were many problems to be investigated, chief among them being that of adequate cooling at

different speeds and heights for a minimum of drag. Modern installations show how well the designers have succeeded in this direction, in addition to achieving the desirable feature of interchangeability.

Shore-based and Ship-borne Aircraft

FOLLOWING close on the heels of the great fight of the convoy to Malta comes the equally gallant and strenuous battle to take a very large convoy to northern Russia and bring another lot of ships home. All three voyages and fights tell the same story, and it is a very comforting one for Britain and the United Nations. In the struggle for life against the Axis nothing would avail us if we could not sail the high seas and get the majority of our ships to their destination. These fights have shown that the Royal Navy, provided that it has adequate air cover, can force its way through, despite the worst that enemy aircraft and submarines can do.

These convoys have been fortunate in having Sea Hurricanes in their carriers, and on the voyage to Russia they, together with the anti-aircraft gunners on the ships (who have by now acquired a high degree of skill and accuracy) hit the German bombers so hard that on the return voyage the convoy was not attacked at all from the air. The destroyer and the trawler which were lost both fell victims to torpedoes fired by submarines. One wonders whether the Germans had actually run short of bombers, or whether they had come to the conclusion that another air attack was simply not worth while.

These convoy battles have given rise to some misapprehension. It has been pointed out that the victors were ship-borne aircraft, while the attackers were shore-based, and the suggestion has been made that the theory so often announced of the superiority of shore-based aircraft must be to some extent fallacious. In reality the theory has been misunderstood. It is a fact that shore-based aircraft must be superior to carrier-borne machines, but only class for class. The short-range fighter from the land must be better than the ship's fighter, and the same applies to the two classes of bombers. But a Hurricane flown off a deck must be, and is, well able to account for any bomber. It also has an advantage over a long-range fighter from the shore.

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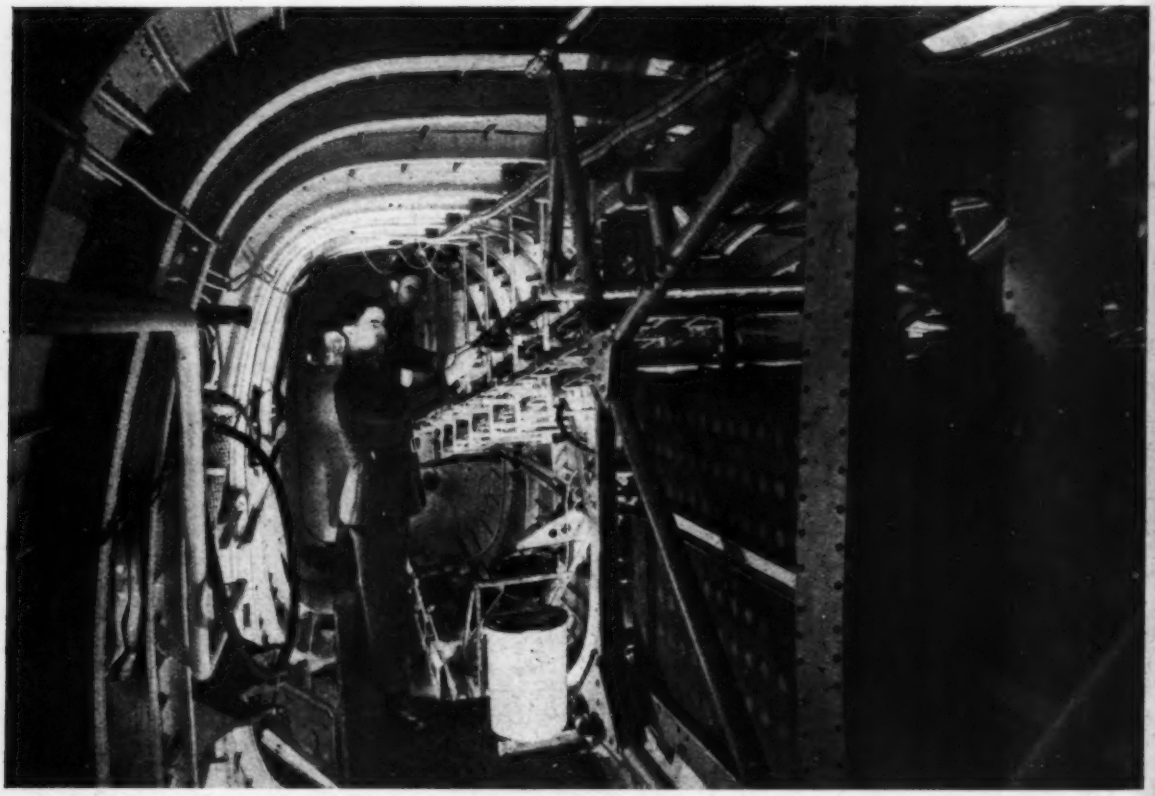


MINISTERS TO THE INTERIOR: Armourers loading the servo-feeds of ammunition for the rear turret of a Halifax. For each of the four .303 Browning guns an extra supply of ammunition is carried amidships and fed to the rear of the fuselage by long chutes.

War in the Air

A Beaufort torpedo-bomber of Mediterranean Command looking for enemy shipping over the Ionian Sea.

Raid on Rommel's Airfields : Aircraft in Russian Battles : Convoy Battle in the Arctic : Defence by Air in the Pacific

THIS week pride of place must be given to the daring raids by our mobile patrols on the enemy's bases and airfields at Benghazi, Barce, and the oasis of Jalo. These exploits were probably without precedent in war, for the British and Empire patrols penetrated some 500 miles behind the enemy's front lines. The attacks on Benghazi and Barce were made on the same night as the combined raid by all three Services on Tobruk. The patrols destroyed more than thirty enemy aircraft on the ground that night, besides doing other damage. This must be a distinctly nasty blow for Rommel, who was already outnumbered by the Empire in the air, and who cannot look for unlimited supplies from Europe to take the place of those lost while the *Luftwaffe* is so hotly engaged in Russia. If he does get some replacements, so much the better for the Russians.

Two nights later another column attacked the Jalo oasis, some 200 miles to the south, which was held by Italian troops, and stayed there for several days destroying dumps of ammunition and other supplies. When they had done their work all three columns withdrew and reached their own lines. These raids must have been no light shock to the nerves of both Italians and Germans, for the garrisons of all three places must have thought themselves quite safe from anything except air attack. The enterprise shown by the Eighth Army in undertaking such astounding raids fills one with confidence. The spirit of that Army is evidently of the highest, and one begins to feel that Rommel has now met his master.

Of less importance, but still satisfactory, is the news announced by the Germans themselves that Capt. Helmuth Belzer, a holder of the Knight's Cross of the Iron Cross, has been killed in action in Africa.

Not much has been heard of air activities during the slow but steady advance of Empire troops in Madagascar towards the capital, Antananarivo, which has been occupied. When our troops arrived there they found at least four South African airmen whose machine had developed engine trouble and had crashed into a river on the way up. One, Lt. van der Byl, had been sent to hospital, but the others were apparently all right. The aircraft had been left in the river because of disputes between various French parties as to who should be allowed to salvage it.

Before turning to the other fighting fronts, it is well worth recording some words of Mr. Ben Smith, M.P., Parliamentary Secretary to the Ministry of Aircraft Production, who

WELL DUG IN : The end of an Fw.190 shot down over the South Coast.

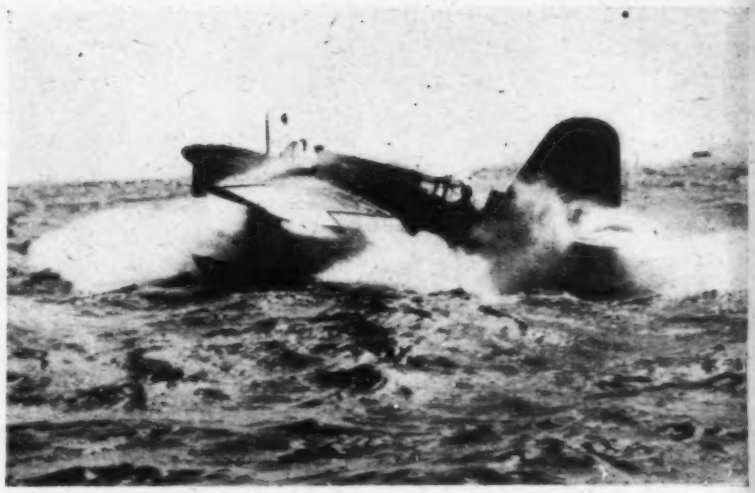
WAR IN THE AIR

has stated that in the first half of the present year Britain had exported to Russia, the Middle East and elsewhere well over three times as many aircraft as had been imported. That ought to give the Axis something on which to ponder. If we can bomb Germany as hard as we have been doing while that drain on our production is going on, they may well wonder what we shall do when American production surpasses ours, as it soon will do, and puts the bomber strength in the United Kingdom in an overwhelming position.

The Arctic Convoy

THE greatest convoy of supplies ever despatched to Russia reached a port in the north of that country after a fierce sea and air battle which lasted for eight days. It was attacked by German U-boats and aircraft, the latter including both bombers and torpedo-carriers. The Germans claimed that they had destroyed the greater part of the convoy, but their claims were more wildly exaggerated than usual. The convoy consisted of British, Russian and American ships, and some of them were lost, but the exact number of losses is not being made public at present. There was a strong escort which the Germans said included "one aircraft carrier, several battleships of the *King George V* class, and numerous cruisers and destroyers." Judging from a recent speech by Mr. Alexander, First Lord of the Admiralty, it is possible that the new battleships H.M.S. *Anson* and *Howe* are now in commission. Certainly there must have been a strong umbrella of fighters, and perhaps there was more than one carrier with the naval escort. At any rate none of the escort vessels was lost. The Commodore of the convoy, Admiral E. K. Boddam-Whetham, who went on to Moscow after seeing his charge into port, said that the Axis must have lost between 50 and 60 aircraft in combats with our fighters or from the A.A. fire of the ships. The majority of these Axis losses occurred during the early stages of the fight, and they had their effect, for the vehemence of the enemy's bombing decreased markedly in the later stages. As the convoy got near its goal Russian destroyers and Hurricanes came out to assist.

The two fights for the Malta convoy and this Arctic convoy support the view which the Admiralty has always held, namely that the Royal Navy, provided it has its essential air component, cannot be prevented from carrying out its work by enemy air action, even though that is supported by submarine attacks. But the tragedy of H.M.S. *Prince of Wales* and *Repulse* showed that the air component is a *sine qua non*.



FLOATPLANE RECONNAISSANCE: A Curtiss S.O. 3C-1 Seagull taking off in rough water. The Seagull is a single-float mid-wing monoplane with a 520 h.p. Ranger V-770-6 12-cylinder inverted air-cooled engine.

U.S. paratroops boarding Douglas C.47s (D.C.3s) on manoeuvres. There are several alternative loadings for a C.47:—(1) 1 mortar, 1 machine gun and 15 men. (2) 1 75 mm. howitzer, 1 Jeep and 8 men. (3) 2 anti-tank guns, ammunition and 11 men. (4) 16-20 riflemen and equipment. (5) 4 motor bicycles, 4 bicycles and 12 men.

Air War in the West

The weather turned unusually unpleasant in the middle of September, and in consequence a large force of four-engined bombers which attacked Flensburg on the Baltic and other places in north-west Germany on the night of September 23rd had a very trying time with electric storms and icing conditions. Heavy bombs were dropped on the yards where U-boats are built, and it is hoped that this attack will reduce the number of these pests in the Atlantic, even though the Germans have put up strong concrete shelters over the yards. The loss of ten bombers that night is a moderate price to pay for a result which may save the lives of hundreds of sailors and their invaluable ships and cargoes. Destroying these wasp nests is perhaps the most valuable contribution which Bomber Command can now make towards the victory of the United Nations.

While Fighter Command has been busily putting shells through the works of locomotive engines in northern France, special bombers have been very busy laying mines in enemy waters. The Germans gave us the tip about magnetic mines, and now we are treating them to a dose of their own medicine. They may sweep a channel during the day, but they never know

WAR IN THE AIR

BRITISH AIR LOSSES TO SEPT. 26th.

	Over G.B. A'crft.	Over Continent B'brs.	Over Continent Ftrs.	Middle East A'crft.
Sept. 20	0	0	0	4
,, 21	0	0	1	0
,, 22	0	2	1	0
,, 23	0	10	1	1
,, 24	0	0	0	1
,, 25	0	1	0	0
,, 26	0	0	0	2
	0	13	3	8

Totals: West, 4,782; Middle East, about 1,718.

if it has been sown again during the following night. Our intelligence people know about some of the enemy ships which are destroyed by these mines, but probably the actual number is about double those reported.

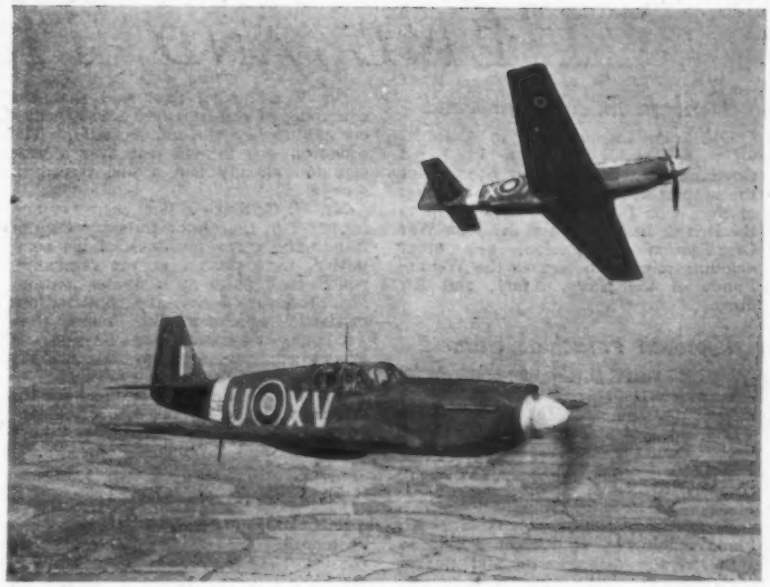
Coastal Command is an amazing organisation. Air Chief Marshal Sir Philip Joubert de la Ferté commands a body which is larger than the whole R.A.F. was in 1939, and it includes many different classes of aircraft. Lately it has been waging a strenuous battle in the Bay of Biscay. Sunderlands and other heavy aircraft fly out there to search for U-boats. The enemy sends out long-range fighters to drive off our scouting machines, and so we in turn send out Beaufighters to deal with them. A number of very satisfactory engagements has been reported.

Mosquito on Ops.

THE new Mosquito light bomber made its official debut (so far as official communiqués are concerned) with a sensational daylight raid by four machines on the Nazi headquarters in Oslo. This attack involved a round trip of over 1,000 miles in daylight—a portent of things to come. Fast and manœuvrable, this latest twin-engined monoplane has been in use for some time. The Germans at first described the raiders as twin-engined Douglas Bostons, so fast and cunningly did the quartette attack their target. Although Fw.190 fighters got on the tails of the Mosquitos, they took a Quisling meeting by surprise and delegates ran for shelters. Sqn. Ldr. D. A. G. Parry led the raid, his 60th sortie, incidentally. Sqn. Ldr. Parry has recently been awarded a Bar to his D.F.C., and his portrait appears on page 375.

Flying at not more than 100 feet, they dropped several bombs on the building, which is the headquarters of the Gestapo, and made various holes in it. One was shot down by the Focke-Wulfs, but the rest got home. Norwegians are delighted.

Somehow one does not often think of the Air-Sea Rescue Launches as likely to incur heavy casualties, but the launches are sometimes attacked by enemy aircraft. On one such occasion recently F/O. J. R. L. Hill was killed in such an attack. His loss comes home with special poignancy to all sections of the Press which are interested in air matters, for F/O. Hill was not long ago an official in the Press Section of the Air Ministry, and most air correspondents have profited by his friendly readiness to help them.



FIGHTER RECO: Two N.A. Mustangs of Army Co-operation Command break formation. The two views thus presented show all the salient features of the world's fastest fighter-reconnaissance machine.

ENEMY AIR LOSSES TO SEPT. 26th:

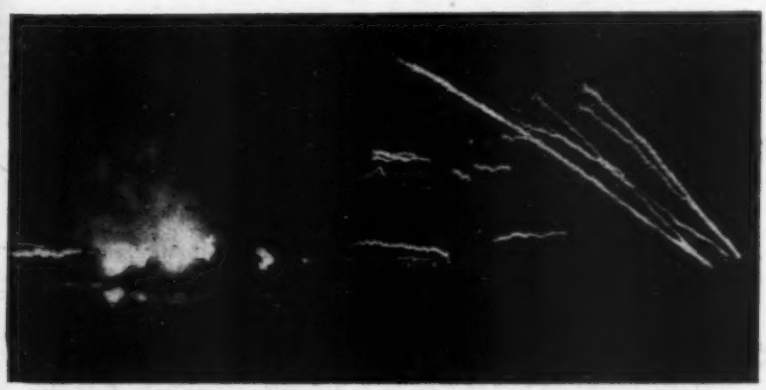
	Over G.B.	Over Continent	Middle East
Sept. 20	0	0	4
,, 21	0	0	1
,, 22	0	0	0
,, 23	1	1	0
,, 24	1	3	1
,, 25	1	0	2
,, 26	0	0	7
	3	4	15

Totals: West, 6,353; Middle East, over 4,573.

Near and Far East

AIRCRAFT cannot play much part in the street fighting in Stalingrad, for the infantry of the two sides are too closely locked together. The city itself has been bombed into ruins. But farther to the north Russian tanks and aircraft have been prominent in the diversionary attack, which has begun to make appreciable progress. The *Luftwaffe* has also been active there. On one day recently 2,000 German sorties were made. Russian fighters, none the less, gave valuable protection to their advancing troops, and Stormoviks made havoc of some enemy supply columns, and also attacked his tanks. At Leningrad it is said that Italian Fiats and Capronis have been encountered in large numbers.

In the South West Pacific General MacArthur continues to hold off the Japanese mainly by use of his bombers. Fortresses are unceasingly active, and the smallness of their losses is quite remarkable.



MOONLIGHT SONATA: Warships' guns and tracer shells light the sky of the Mediterranean during an enemy air attack.

HERE AND THERE

Northern Ireland War Fund

SINCE its inauguration in October, 1939, the Northern Ireland Governor's Fund has raised £59,920 for the support of various war organisations; of that sum £37,250 has been given to the British Red Cross and St. John War Organisation in London, and other amounts have been sent to the Welfare Funds of the Navy, Army, and Air Force.

Improved Parachute Harness

A FLEXIBLY adjustable, comfortable parachute harness provided with straps that pass to the back of the wearer's thighs and take up most of the shock when the chute opens is the subject of a United States patent issued recently to F. J. Manson and J. J. Maskey, of Dayton, Ohio.

Presumably the designers are Air Force employees at Wright Field, as right to the manufacture and use of such chutes without payment of royalty has been granted by them to the Government.

"Motor Trade" Squadron's Badge

AIR VICE-MARSHAL R. E. SAUL, C.B., D.F.C., Air Officer Commanding a group in Fighter Command recently presented a specially designed badge to the "Motor Trade" fighter squadron, whose aircraft were purchased for the nation with money raised by the Motor Industries Fighter Fund.

The badge bears the inscriptions: "By this means to victory." The symbol, appropriate to the donors, is a road-sign, the circle and diagonal line denoting "No speed limit."

Air Vice-Marshal Saul said that the equipping of the squadron was a generous gesture by the motor trade. The squadron was formed just over a year ago and already had a fine record of service.

Mr. H. G. Starley, hon. secretary and organiser of the Motor Industry Fighter Fund, and other members of his committee, were present at the ceremony, which took place at a fighter station. Mr. Starley said that the contributions received, which totalled more than £100,000, had come from everyone and everywhere, some from workpeople, some from big firms.

The squadron aircraft paraded for the ceremony included those bearing the names of "Lord Austin," "Lord Nuffield," and "William Rootes."

Bombed His Own Home

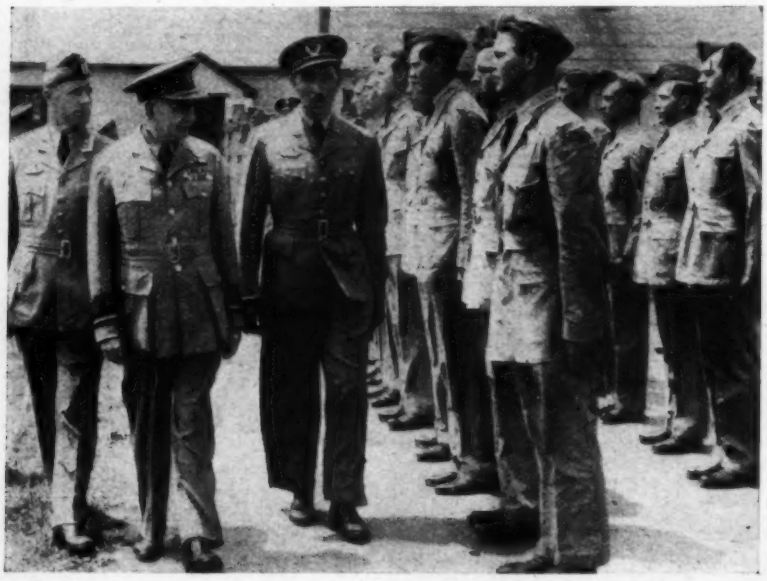
IN a copy of *Empire Airways*, the monthly magazine published by Qantas Empire Airways, of Sydney, Australia, there is the story of an R.A.A.F. pilot who bombed his own home at Lae, New Guinea.

He was Sqn. Ldr. C. R. Gurney, a former Qantas captain and subsequently killed in a raid against the Japs.

Before joining Qantas, Gurney had been with Guinea Airways, and his house at Lae was being used as part of the Jap headquarters by the invaders.

According to the story, Gurney insisted on taking part in a raid on Lae, urging that he not only knew the place better than anyone else on the station, but could claim a prior right in smashing up his own home.

He went, and from the aircraft he flew was launched the bomb that blew his own house to smithereens.



IN "LITTLE NORWAY": Air Chief Marshal Sir Frederick Bowhill, chief of the R.A.F. Ferry Command in Canada, inspects men of the Royal Norwegian Air Force Training Centre in the Dominion. Sir Frederick, who was accompanied by Lady Bowhill, expressed satisfaction with the training facilities at "Little Norway" and complimented the pilots on their work.

Xmas Cards for British Prisoners

THE Postmaster-General announces that the general censorship regulations concerning the despatch of Christmas and New Year greetings cards to places abroad will again be relaxed this year. Greetings cards may be posted by members of the public to British prisoners of war and internees in enemy and enemy-occupied countries (other than Japan or Japanese-occupied territories) and in neutral countries.

The cards should bear no writing other than the name and address of the sender and addressee. They must not be enclosed with letters, but must be sent in separate unsealed covers, which should be addressed in the usual way for prisoners of war and internees and clearly marked "Greetings card only." No postage is payable unless they are sent by air mail. Cards bearing divisional or other formation signs or unit names may not be sent; cards bearing regimental crests are, however, allowed.

Special Feature

ON page 359 of this issue of *Flight* will be found a special drawing of the Bristol Hercules III power unit. This is a part-section drawing containing a wealth of detail and shows the complete unit mounted on its bulkhead. All the most important parts are lettered, and an accompanying key makes a detailed study of the unit a simple matter.

The Bristol Hercules is Britain's representative type of air-cooled radial engine and is a 14-cylinder, two-row, sleeve-valve design, developing more than 1,600 h.p. for take-off. With low-speed supercharging its climbing power is 1,170 h.p. at 2,500ft., and with the supercharger in high gear 1,090 h.p. at 14,500ft. Its maximum power for level flight with low- and high-gear supercharging is 1,425 h.p. at 14,500ft. and 1,270 h.p. at 15,000ft. respectively.

The Mustang's Ancestry

THERE is an impression abroad that the Mustang, designed by the North American Aviation staff, has a distinct streak of the Me109 because the designer (it was stated) spent some years in the Messerschmitt drawing office. Such a suggestion appeared in our description of the machine and has been reiterated by other journals.

Although the information came from a good source, we are assured by North American Aviation that, to the best of their knowledge and belief, there are no former Messerschmitt employees among their personnel. Furthermore, they are certain that no Messerschmitt employees were members of the group in their Engineering Department which actually worked on the original design of the P.51 Mustang.

The Chief Design Engineer responsible for the designing of the Mustang is Mr. Edgar Schmued. Mr. Schmued is a naturalised U.S. citizen, of Bavarian birth who served on the technical staff of the Austrian Air Service in the last war. He left Europe in 1925 and never had any association with the Messerschmitt Company.

The publication of these facts will assist in arresting the report which has gained fairly wide circulation.

SEVERSKY SPEAKS OUT

Famous American Aircraft Designer Debunks the Ballyhoo Advertising of U.S. Manufacturers : Claims of Fighter Supremacy Disproved in Air Battles

EVER since Great Britain received the first American aircraft for service with the R.A.F. in the present war, there have been comparisons between their machines and our own. This was inevitable, and, unfortunately, some of the critics on this side of the Atlantic either failed to appreciate certain aspects of the matter or were too intent on getting publicity for themselves by running down American aircraft to care two hoots about the possible effects upon the war effort as a whole.

Never in the history of our two countries has it been more necessary for Britain and America to achieve a genuine mutual understanding, not only for the successful prosecution of the war but so that we may not again mismanage the reconstruction to follow. Never before, moreover, has there been such an excellent opportunity for the American and British peoples to "get together" in the most complete sense of the term ; it would be a calamity of the first magnitude, therefore, if ill-advised criticism were allowed to jeopardise our relationships.

The well-known slogan of the Nazis is "Divide and conquer," and one can well imagine the glee with which Dr. Goebbels and his propaganda experts will seize upon, and distort, anything which might be turned to use in this direction ; it is to be feared that some forms of rather cheap and "clever-clever" criticism of U.S. aircraft which have emanated from certain writers in this country lend themselves only too readily to Axis propaganda efforts designed to sabotage Anglo-American co-operation.

Helpful Criticism

This is not to suggest, however, that all criticism of our Ally's products should be avoided, but it *does* mean that it should be couched in helpfully constructive terms when it emanates from this side of the Atlantic, instead of being made the subject of lamentably "bright" journalism guaranteed only to irritate Americans. That such "brightness" has a high commercial value with a certain type of publication is probably the chief reason why a few writers indulge in it, and needless to say, it is invariably ill-informed.

One cannot blame the American citizen if he regards adverse criticism of his country's aircraft from British pens as being merely an exhibition of national partisanship—and an ungrateful exhibition at that, because God knows we needed their help badly enough!

On the other hand, he is bound to sit up and take notice when criticism comes from an acknowledged aviation expert in his own country, and this he has recently received from Major Alexander Seversky, whose position in America as a successful aircraft designer commands considerable respect.

Major Seversky is not only concerned with the shortcomings of American aircraft from the operational viewpoint ; he is equally alarmed by the ballyhoo put out by American advertisements which misleads their own people into the belief that American aircraft are the best in the world no matter from what angle you judge them, and he has recently had published in *The American Mercury* an article which frankly debunks the exaggerated claims to superiority which characterise many of the advertisements of American aircraft firms in their own popular journals.

In the main it appears that these advertisements do not offer direct comparison between American and British aircraft (they might be less dangerous if that was all they did), but they assure the American public that their own aircraft are superior to those of the enemy, and this, says Major Seversky, acts as a soporific when what they need is a stimulant. "What we require from American public opinion," he says, "is not easy applause but tough challenge.

"Whatever reverses we may suffer on the field of battle, we continue to be magnificently victorious in our publicity, advertising and after-dinner oratory. True, our fighter planes may be outclassed by British, German and even Jap fighters. But gleaming pursuits, doctored by commercial artists, zoom through picturesque skies to do superman feats in full-page newspaper ads. and double-spreads in the magazines."

Well, not even the most tactless of British critics ever used such scathingly outspoken phraseology as that!

Credit Wrongly Placed

Major Seversky makes some very sound points in the course of this article which, had space and the paper ration permitted, we should have liked to reproduce in full. For example, he points out that some of these advertisements (indeed, nearly all of them) give the credit for such victories as American airmen have achieved to the machines they fly, and even to the 100 octane fuel they use, when the truth is that the gallant Yankee pilots "are doing superb work *despite* inferior equipment."

One statement by an oil company, quoted by the Major, tells the American public that "Our pilots fly faster, fly higher, fly farther than Axis planes because of 100 Octane Aviation Gasoline."

Skipping the fact that all the major nations, including Germany, use 100 octane fuel, Major Seversky says that American planes do not fly faster than either German or British pursuits, neither do they fly higher nor farther.

"Our main fighters," he writes, "the Kittyhawk and Tomahawk and the Airacobra, are stymied by engine shortcomings above the critical altitude of 16,000ft., though British and Axis aircraft function above 30,000ft. Only in the bomber class, where speed is not the paramount consideration, do we measure up, but British bombers could easily outdistance American bombers with equal useful loads ; Jap pursuits have utilised emergency ranges that left us sadly in the lurch."

Another instance quoted by the author of this fearless article is that of a General Motors advertisement for the Allison engine, on the back cover of the magazine *Liberty*. With a picture of the P-40 is made the claim that *communiqués* from the Middle East, the South Pacific and Russia report that "nothing in the Axis air armada can match the sharp-nosed fleetness of this liquid-cooled engine."

The "Inside" Story

Condemning this as an extraordinary exaggeration, Major Seversky adds: "Ironically, the reader can turn to the inside pages of the same issue, where an able aviation reporter, Frederick L. Collins, tells some unadorned truths that belie the ad. It was the enemy's knowledge of our aviation deficiencies, he shows, which emboldened Japan to start war on us," and he quotes the following extract from the article by Collins: "In pursuit and fighter aircraft, our very best products, primarily designed for speed on a moderate level, were no match for high-flying enemy models. The terrifying fact remained that thousands of American boys who risked death and defeat in the battle of the air left the ground under the well-nigh insuperable handicap of aerial inferiority."

Public speakers in America are also taken to task for feeding their hearers on exaggerated optimism, and Major Seversky tells how he was present at a luncheon at the

Waldorf-Astoria, when an eminent publisher evoked wild applause from 1,500 guests with accounts of American tank and gun production. These were true enough so far as mass-production figures and speed-up technique were concerned, and, in that respect, "entitled to a big hand from any body of Americans."

"But it would have been better if the audience had also heard a word about the shortcomings of those tanks and guns," says the Major. "A few weeks later came the disaster in Libya, in part because our guns were inferior to Rommel's tank artillery in calibre and muzzle velocity. The same speaker also evoked applause when he talked about our P-40 fighters equipped with *the most powerful liquid-cooled engines in the world.* As a layman he was probably unaware of the British Napier Sabre with more than 2,000 h.p., and the new Daimler-Benz engine which powers Hitler's new fighter . . . . Yet the well-meant American boast referred to an engine until recently of 1,150 h.p., and only now beginning to come off the line in a 1,325 h.p. version; and the new version, like the old, loses power above the critical level of 16,000ft.

Who Are They Fooling?

"That publisher, along with the whole American people, is simply a victim of what looks suspiciously like a deliberate effort to placate American public opinion. We are being given soothing syrups and sales talks instead of hard, cold facts. The master minds responsible for the situation cannot be naïve enough to think they are fooling the Axis. Is the great idea, then, to fool the American people?

"The most alarming part of it is that the biggest 'selling' job is being done precisely on the least combat-worthy equipment. It is as though someone were trying to smooth over defects with fancy 'public relations'; as if those responsible for backwardness hoped to *cover* up until they can *catch* up.

"Consciously or unconsciously, the people and the groups which contributed to our aviation backwardness have tolerated, if not actually encouraged, consoling exaggeration of the quality of our planes. Among them, it is true, there are men who are blameless as individuals, being victims of the conjuncture of events and forces. Their patriotic duty in this national crisis, it seems to me, is to take the American people fully into their confidence, so that together we may face in a candid spirit the gigantic job of assuming world air leadership.

"Thus far, however, the spirit has been the opposite of candid. The arrival of the P-40's in Britain, early in the war, was made the occasion for fanfares of publicity. The fact that they could not be used in Britain on account of inferior performance was soft-pedaled. Indeed, 'mock battles' were staged, intended to convey the idea that these planes were a match for Spitfires in action. There were photographs out of England, featured in the press here, with captions implying that these American planes were in active combat duty in England; in actuality, they were being used for air-ground co-operation training purposes.

"The Bell Airacobra is a magnificent job of designing and construction. But like the P-40, it has been sadly handicapped by its inadequate engine. Curiously, big sums are being spent on advertisements to glorify that very engine! One ad. actually underscores the 1,150 horse-power, as if it were a special virtue. . . . Sometimes, of course, the fighting is at lower altitudes, where the handicapped planes give a first-rate account of themselves; but that doesn't alter the fact of deficient horse-power and inferiority at vital upper levels of combat."

Proof From Pilots

As further proof of the inadequate performance of the American fighter, Major Seversky quotes an American pilot with battle experience against the Japs in their "Zero pursuits."

"When you fly a P-40 against a Zero," said this pilot, "you can make one pass at him. Then, if you miss, you had better get the hell out of there."

This judgment, he adds, has been confirmed by General Chennault, commander of the famous "Flying Tigers" in Burma, who taught his airmen this: "Never attack alone; one P-40 against one Jap is outnumbered three-to-one."

Major Seversky lays the blame for this deficiency on "the sorry heritage of long years of underestimation of the air weapon, and the illogical subservience of our airmen to infantry and naval leadership.

"If this were advertising to promote washing-machines or other peacetime products," he comments, "the customers would have ample cause for squawking to the proper legal authorities. The fact that in this instance the only customer is Uncle Sam, whose very survival is at stake, is even more reason why the public should look into the matter."

Fortunately, Major Seversky is by no means a voice crying in the wilderness, for he points out that there is plenty of realistic facing of facts by working newspapermen and active pilots on the fighting fronts, and he quotes the "courageous and justified blast" of Major Al. Williams who stated: "If Americans knew as much about our planes as the enemy does, the chances are they'd get something done," the writing of John Lardner in *Newsweek*, of William Clemmens in *Collier's*, and Ray Maley's *United Press* dispatch from the South West Pacific, all of whom tell the same story of U.S. fighters outflown by those of the enemy.

Let us hope America will listen to her own critics.

New S.B.A.C. Member

THE Society of British Aircraft Constructors announce that Phillips and Powis Aircraft, Ltd., makers of Miles trainer and target towing aircraft for the Royal Air Force, have been elected to Ordinary (or full) Membership of the Society. They had been Associate Constructor Members since January, 1936. Mr. F. G. Miles, head of the company, joins the Society's Council.

This new accession brings the number of Ordinary Member firms to 19, comprising the leading British companies engaged in the design and manufacture of aircraft and aero engines.

The Society is the officially recognised representative body of the British Aircraft Industry. Founded in 1916 at the request of the Government to represent the views of the industry as a whole on all matters of general interest, it is largely engaged in the technical development of aircraft, engines and components and in many activities directed to improve aircraft production, including standardisation of parts and materials and the development of plastic substances to replace light alloys in aircraft structure.

The President of the Society is Mr. A. F. Sidgreaves, O.B.E., managing director of Rolls-Royce, Ltd., and its permanent Executive Chairman is Sir Charles Bruce-Gardner. The Society's governing body—the Council—is made up of representatives of Ordinary Members, Associate Constructors and Associate Members—the last member category embraces companies engaged in the manufacture of materials, components, accessories and equipment.

Artist and A/C.2

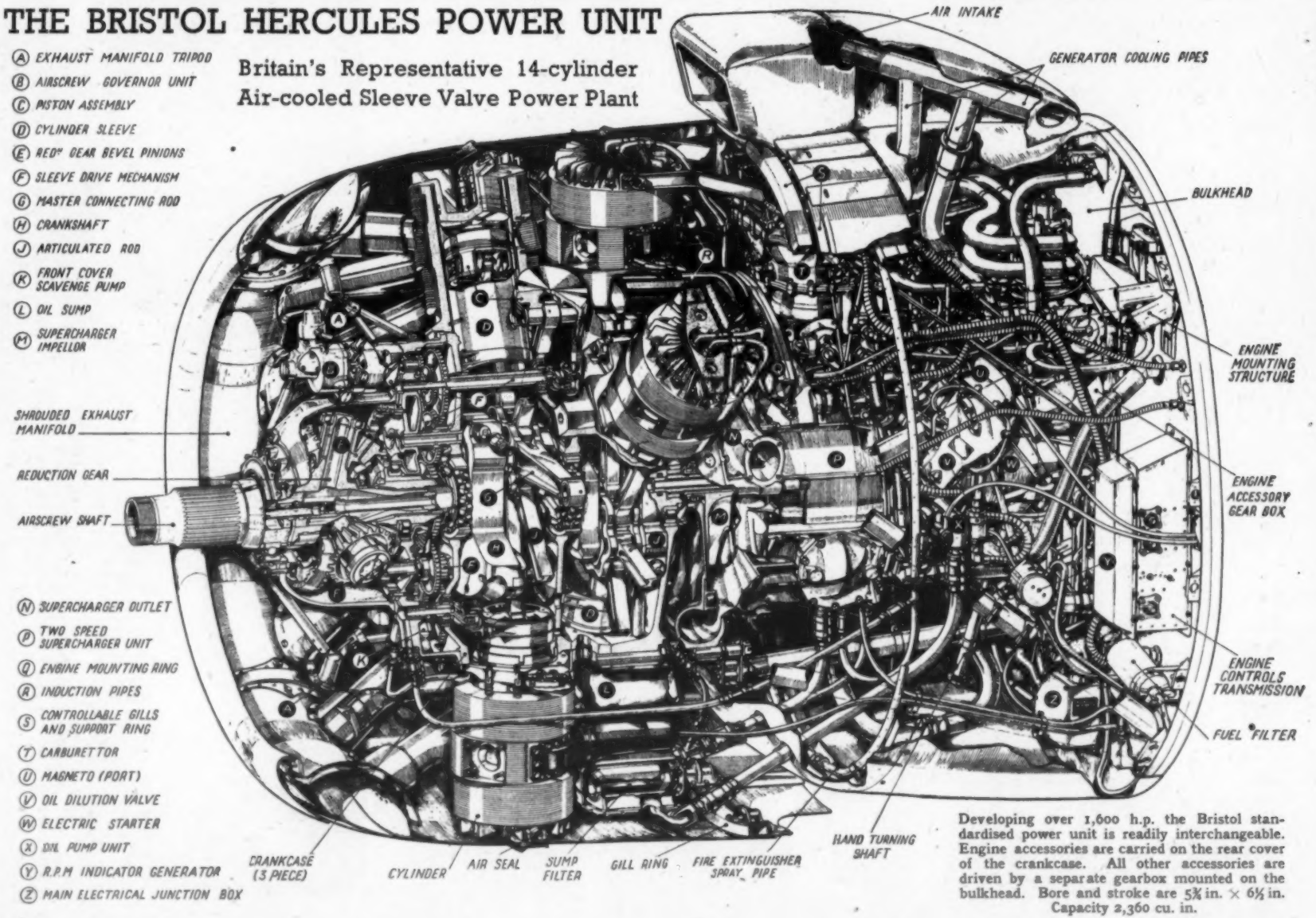
ROYAL AIR FORCE personnel quietly contribute many things besides their services to King and Country. The cover picture on this week's issue of *Flight* is a reproduction of a painting by Keith Shackleton, son of Mr. W. S. Shackleton, who is an A/C.2 in the R.A.F.

Keith Shackleton is only eighteen, but his work as an artist is already gaining recognition, and has been compared by some critics with that of Peter Scott, son of the famous explorer. Young Shackleton was educated at Oundle, where he was for a time captain of shooting. His hobbies are fishing and shooting, which pursuits give him the opportunity to study wildfowl subjects for his paintings. It seems a little odd that the R.A.F. cannot make better use of his abilities.

Mr. Shackleton's elder son, P/O. Allen E. Shackleton, R.A.F.V.R., has been missing from an operational flight for some weeks. It is to be hoped that he is a prisoner of war, and that news of him will be received in due course. Allen Shackleton was, like his brother, educated at Oundle, and afterwards Pembroke College, Cambridge. He learned to fly in America, having been a pupil at the Spartan School of Aeronautics, Tulsa, Oklahoma.

THE BRISTOL HERCULES POWER UNIT

Britain's Representative 14-cylinder Air-cooled Sleeve Valve Power Plant



Developing over 1,600 h.p. the Bristol standardised power unit is readily interchangeable. Engine accessories are carried on the rear cover of the crankcase. All other accessories are driven by a separate gearbox mounted on the bulkhead. Bore and stroke are 5¾ in. × 6½ in. Capacity 2,360 cu. in.

RIDING THE WIND

Converting American Light Planes Into Gliders

By HARRY WILKIN PERRY

THE practical utility of small gliders for pilot training, and huge gliders for paratroop transport, was ignored by United States military authorities up to two years ago, but events in Europe, particularly the use of transport gliders by the Nazis for the invasion of Crete and their use on both sides along the Russian front, considerably changed this attitude of mind. As a result of agitation by a number of members of Congress, a small group of Army Air Corps officers were sent to Elmira, N.Y., in 1940, to take a course of training in glider piloting, and these men were appointed official observers at the 12th annual meeting of the Soaring Society of America held there the last week in June of that year. Since then the Army has established a soaring school in the Midwest, where pilots are learning the science of glider flying, and there is also a school on the Pacific Coast.

Officers and men of the Marine Corps also have been undergoing training in glider operation at Marine Barracks in South Carolina for more than a year.

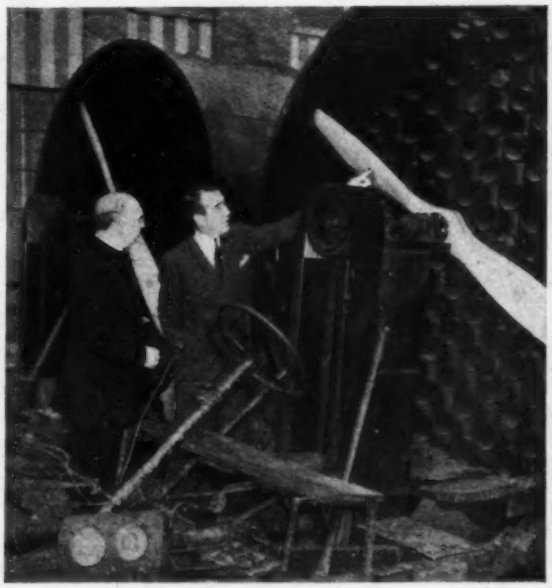
An interesting innovation adopted at the Army school for preliminary glider training is the use of unique "wind wagons," which create an air current that sustains a glider only a few feet above the ground over a given spot while the pilot safely learns to operate the controls, the glider being held within certain limits of movement by cables at the front. The machines make unnecessary the usual practice of launching gliders by towline and releasing them high above the ground. They were invented by the president of the Zenith Radio Corporation and perfected and built by the Winchester Corporation, manufacturer of wind-driven electric generating plants.

Stationary Lift

Each wind machine is mounted on a conventional automobile chassis and can travel at 50 m.p.h. When the vehicle is stationary, the engine can be connected to a horizontal shaft on which a large-diameter airscrew is mounted within a big sheet-steel cylinder open at both ends. The machine is capable of creating a horizontal wind that is controllable at velocities up to a maximum of 50 m.p.h.

The man most responsible for glider training on a large scale is probably Charles Stanton, administrator of the Civil Aeronautics Administration, which has charge of the Civilian Pilot Training Programme as well as the construction and maintenance of airports and airways and the supervision of airline operation. This year's Congressional appropriations for these purposes amount to £77,500,000, of which £18,000,000 is for civilian pilot training. When it became evident that glider training should be included in the course, and something had to be done in a hurry to provide enough gliders for the purpose, which the three small-scale glider builders in the country could not supply, Mr. Stanton directed engineers of the C.A.A. to investigate the practicability of converting small private aircraft into motorless gliders.

The first conversion was made at the plant of the Aeronca Aircraft Corporation, of Middletown, Ohio, where



Close-up of "wind wagons," showing belt drive from the propeller shaft of the chassis to the airscrew shaft. The cellular structure serves to straighten the slipstream.

A Piper Cub light plane modified for installation of a front seat. The undercarriage has been replaced by low landing wheels, and a swivelling tail wheel fitted.

RIDING THE WIND

CONVERTING A TWO-SEATER AERONCA DEFENDER INTO A GLIDER: 1, the glider being towed on to the field; 2, Maurice Fry, Aeronca test pilot, checks the controls; 3, members of the Aeronca research institute give final approval; 4, the training glider takes the air; 5, landing after the first flight; 6, the pilot reports to representatives of the Aeronca concern, the U.S. Army Air Forces, and the Civil Aeronautics Administration; 7 and 8 show two aspects of the glider, and in 9 Major Lewin Barringer, of the U.S. Army Air Forces, prepares to take off.

a two-seater plane was changed into a three-seater glider. Only nine days elapsed between the first telephone call proposing the idea and the first tow of the completed glider.

The first glider was finished by May 20th, and in the afternoon made several auto-tow flights 20 to 30 feet off the ground. Several aerial-tow flights were made the following afternoon, with Major Lewin B. Barringer, glider specialist of the Army Air Forces, at the controls on some flights. On the 22nd the glider was towed to Washington, roughly 500 air miles, by a plane of the Civil Aeronautics Administration, with Major Barringer in the glider. Eighteen test tows were made by Army and C.A.A. officials at the National Airport during three succeeding days, and on May 26th the glider was towed back to the factory, where work had started already on making the necessary jigs for the glider parts. By request, spoilers to complete the design and structure of the glider were designed, built and installed in four days. After twenty-three more test flights the spoiler control was rebuilt for front-seat installation to correct a slight vibration induced by the spoilers, and a swivel tail wheel was added. Type certificate tests for airworthiness were completed June 7th, after a total of 61 tows made and 41 hours in the air.

Success of this conversion resulted in the placing of initial orders for 250 similar conversions, each with the Aeronca Company, the Piper Aircraft Corporation and the Taylorcraft Aviation Corporation. Conversion of the Piper Cub was made by the omission of the engine and engine mount and constructing a front cockpit in the nose. All three seats are provided with complete controls—stick, rudder controls, brake pedals and instruments. The single set of instruments normally provided in the light aircraft serve the two back seats.

The present glider training programme is preliminary to a much larger one to prepare pilots for the use of great transport gliders, the construction of which is being considered and on which a start has been made. Several aircraft plants have for more than a year been building gliders with a wing span of 80ft. and more for the Army. The first of these was delivered last January to the Air Corps at Wright Field, Ohio, for testing. Some time ago the Navy contracted with three companies for fourteen trial gliders—ten two-seater trainers, two 12-seater troop carriers, and two 24-seater carriers, the four large craft to be built of plastic-impregnated and bonded plywood. Both of the 24-seater gliders were to be seaplanes and equipped for towing in the air by Navy combat planes. They were designed to have a wing span of about 110ft. and for a gross weight of 12,000 lb. The 12-seater gliders called for a span of 88ft. and gross weight of 6,500 lb.

BOOK REVIEWS

Electricity in Aircraft (Second Edition). By W. E. Crook, A.M.I.E.E., A.F.R.Ae.S Isaac Pitman and Sons, Ltd. 5s. net.

THE second edition has been made more complete by the addition of a section on the Carbon-pile voltage regulator. As with the first edition and the other well-known elementary handbooks by the same author, it will be found of inestimable value to all whose occupation is connected with electricity in aircraft.

Ground engineers and students will find most of the information they require here in one small volume written in the author's usual clear and easily understandable style, with many diagrammatic illustrations which assist one materially in grasping the numerous principles rapidly.

Introduction to Sea and Air Navigation. By W. M. Smart, M.A., D.Sc., Regius Professor of Astronomy in the University of Glasgow. Some time Instructor-Lieut. R.N. Longmans, Green and Co., 5s. net.

AS a first course in the main principles of navigation the book deals with the subject very well. Within the first few chapters one becomes conversant with simple navigational terms and problems, whilst the examples at the end of each chapter to be worked out by the student gives the cue to proceed with or retrace one's studies.

The book does not exhaust the subject, but deals adequately with basic principles and practical applications made interesting and easily understandable by many simple and clear diagrams and figures. A recommendable work for beginners.

Over the Way with the R.A.F. By H. Howe. Arthur H. Stockwell, Ltd. 6s. 6d. net.

A BOOK on life in the R.A.F. by an aircraftman is a welcome novelty. Mr. Howe enlisted in response to the appeal to "See the World with the R.A.F.," and served from 1920 to 1926, mostly in Aboukir and Hinaidi. He liked the East in general very much, but he did not like Iraq. There, he says, there was little to do in one's spare time but drink too much beer. He admits frankly that he did as others did, but it is quite evident that he disapproved of it all.

Airmen, it seems, resemble sailors and soldiers in their capacity for grumbling, but Mr. Howe is fair-minded in setting the good against the bad in each station where he found himself. He shows a tendency to grumble against discipline, yet at the same time to take a proper pride in being a disciplined man; and while he appreciated comfort whenever it came his way, he comments on the occasion of one very uncomfortable train journey, "it is surprising how Service men can soon adapt themselves to almost anything."

Curiously enough, Mr. Howe has comparatively little to say about the officers under whom he served, though he had unbounded admiration for his C.O. of No. 70 Squadron. It was the N.C.O.s who made all the difference to the life of the men, their contentment and discipline—or otherwise. They were not all loved by the aircraftmen, but, if asked, they might have had their own versions of the stories recounted. But Mr. Howe writes that if he had the time over again he would not hesitate about joining the R.A.F., which is the best testimonial that he could give the Service.

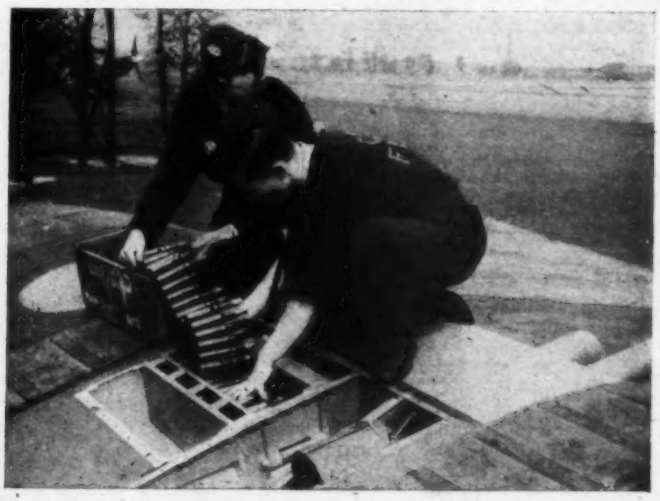
Parachutes in Peace and War, by Professor A. M. Low. John Gifford, Ltd., 2s. 6d. net.

ONE would hardly have thought that now it would have been possible to write a book of 228 pages about parachutes without either going into very technical details or repeating much of what other authors have written. Professor Low has, however, produced a very readable book about all aspects of the parachute and its use, apart from such matters as how it is packed. In the last three years many men have used parachutes who before the outbreak of war never expected to have to do so. Their friends will doubtless like to learn something about the device, and the small cost of this book brings that knowledge within the reach of all.

H.M. Corvette. By Nicholas Monsarrat, author of "This is the Schoolroom." Cassell and Co., Ltd. 2s. net.

CORVETTES and Coastal Command have a great deal to do with each other, and though this book, by an officer of the R.N.V.R., deals mostly with nautical matters, it leaves no doubt about the help which the air gives the sea. "There is a certain comradely pleasure," writes the author, "in meeting an aircraft on long-range reconnaissance. . . . The sense of being on the job together is a very strong one. . . . And, of course, as a means of keeping submarines out of harm's way below the surface they have, time and again, proved themselves invaluable." Air attacks on convoys are briefly but graphically described on other pages.

In addition to its air interest, this book is one which anybody who takes an intelligent interest in the war, whether he be airman, seaman, soldier, or factory worker, must enjoy reading. It tells what life is like in a corvette, and describes the work which these useful craft do. The book is often humorous, sometimes horrifying, but always interesting. No better value for a florin could be found anywhere.



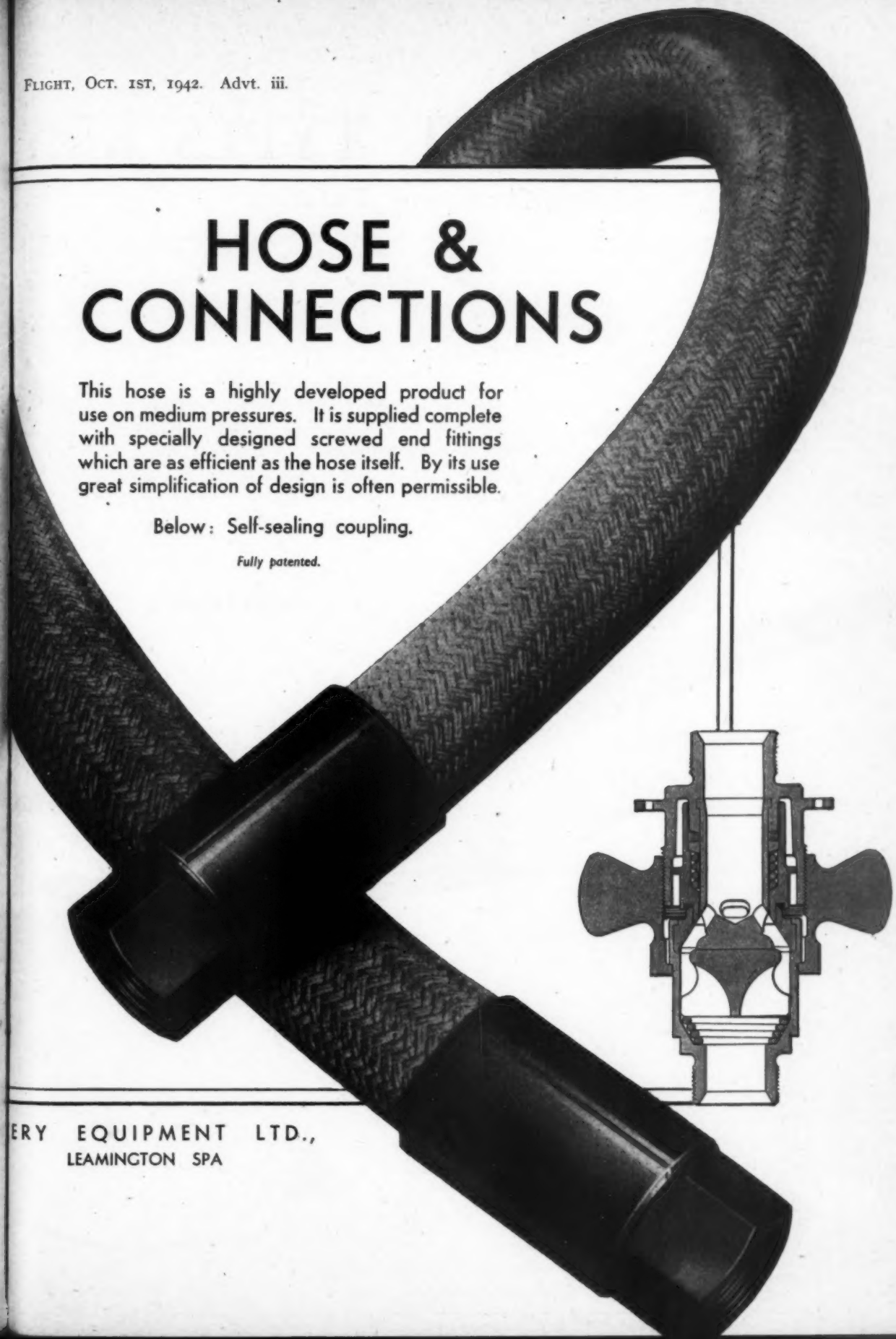
Two views of the installation and re-arming of a 20mm. Hispano cannon in the port wing of a Spitfire. The different coloured nose caps of the 20mm. shells indicate whether they are tracer, armour-piercing, explosive or other variety of ammunition. An early model of the Hispano cannon was used in the last war by Rene Fonck, the French ace. It was mounted between the cylinder banks of an Hispano engine and fired through the airscrew boss.

HOSE & CONNECTIONS

This hose is a highly developed product for use on medium pressures. It is supplied complete with specially designed screwed end fittings which are as efficient as the hose itself. By its use great simplification of design is often permissible.

Below: Self-sealing coupling.

Fully patented.



ERY EQUIPMENT LTD.,
LEAMINGTON SPA

Sixteenth of the New Recognition Series

AIRCRAFT TYPES AND H

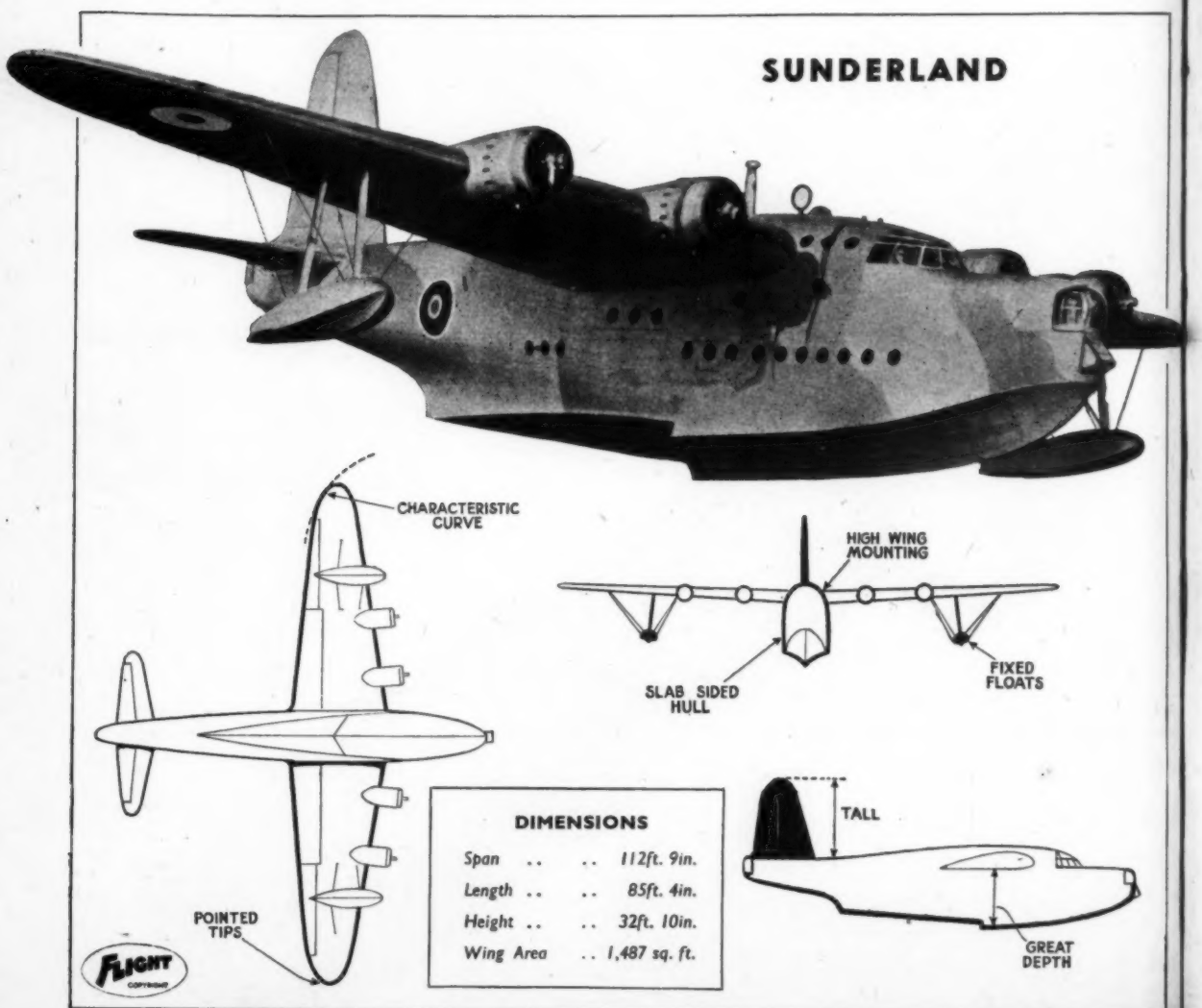
Sunderland and Catalina

A DEVELOPMENT of the Empire "C" class commercial flying boat, the Short Sunderland was first delivered to Coastal Command late in 1938, and has been outstandingly successful on anti-submarine patrols and convoy escort. Having been originally designed with a necessary eye on passenger accommodation and comfort at reasonable operating costs, the Sunderland's cruising speed is satisfactory at 178 m.p.h. and its top speed of 210 m.p.h. with four Bristol Pegasus XXII nine-cylinder air-cooled radial engines, each with a rated output of 840 h.p. at 2,250 r.p.m. at 4,000ft., compares quite favourably with later types designed specifically for military purposes.

As an adaptation of an excellent civil flying boat, at a time when large numbers of this type of aircraft were urgently needed, the Sunderland has proved invaluable and is still giving admirable service. Its normal range is 1,780 miles, but an overload range of 2,900 miles can be obtained. Its ceiling is 20,500ft.

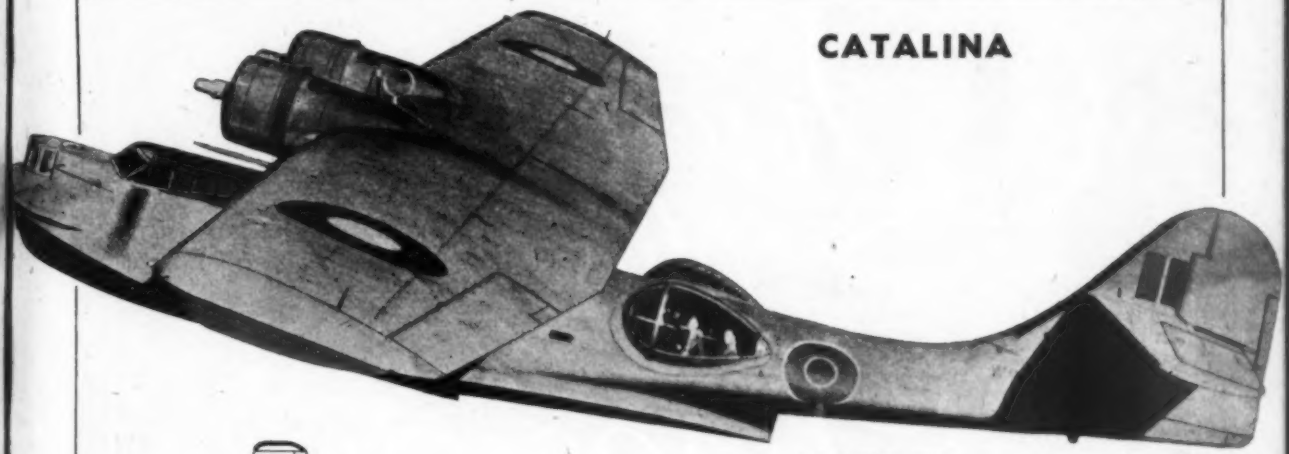
One of the easiest aircraft to recognise, the Sunderland is notable for the depth of its massive hull and its tall symmetrical single fin and rudder. From the head-on view, the hull appears narrow in relation to its depth, while the thickness of its wing section dwarfs the apparent diameter of its engines. The high cantilever wing, which has fixed stabilising floats just outboard of the outer engines, is of high aspect-ratio and tapers uniformly to almost pointed tips. Structurally it comprises a single box spar built up of four extruded "T" sections which form the corners of the box, braced in the lift bays by tubular struts and in the drag bays by built-up members. Leading and trailing edges are separate sections and the whole wing, except for the ailerons, is metal covered, including the Gouge flaps.

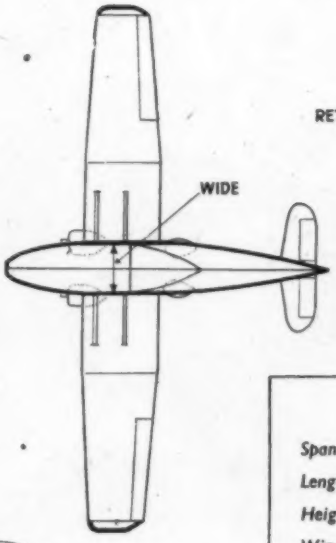
The two-deck hull is built up of channel-section frames interconnected by "Z" section stiffeners, and the Alclad metal sheeting is laid on longitudinally with countersunk riveting. The bomb compartment is within the hull but the racks with their release gear extend into the wing. Armament comprises two power-operated gun turrets in nose and tail and two guns on pillar mountings amidships.

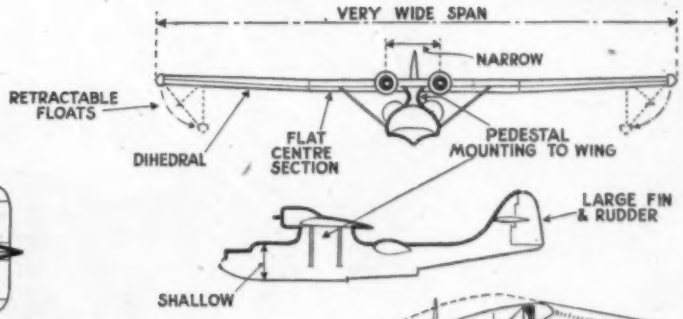


HEIR CHARACTERISTICS

CATALINA

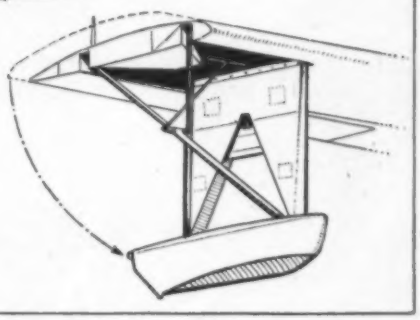






DIMENSIONS

Span	*104ft.*
Length	*65ft. 2in.*
Height	*18ft. 6in.*
Wing Area	*1,400 sq. ft.*



IT may come as a mild surprise to many to learn that the Catalina flying boat dates back to 1935, and is not quite as fast as the Sunderland, although its cruising speed is about the same. But it was designed right from the start as a reconnaissance flying boat and has tremendous range. Catalinas operated by Coastal Command regularly stay in the air for more than 20 hours.

The first PBY flying boat to be acquired by Britain was an experimental machine bought by the Government and flown across the Atlantic in 1939 before the war. The first production models, on which the R.A.F. name of Catalina was bestowed, arrived over here about two years ago. The early batches replaced obsolete types of biplane flying boat and others have replaced Lerwicks; some Sunderland squadrons have also changed over to Catalinas since then. It is also reported that the amphibious version is to be supplied to Coastal Command.

The Catalina is a design of considerable merit and distinctive appearance. Unlike the majority of land machines, it is particularly easy to recognise from the head-on view by virtue of its shallow, almost semi-circular hull, with its twin radial engines set very close together on its pedestal wing. A unique feature is the way in which its stabilising floats retract to form the wing-tips. The wing, which has a very wide span and no flaps, is strut-braced to the hull.

The wings and the monocoque hull are an aluminium alloy structure with flush-riveted stressed-skin covering, except for the control surfaces and the trailing-edge of the wing, which are fabric covered.

Two Pratt and Whitney Twin-Wasp 14-cylinder air-cooled radial engines are fitted, each developing 1,200 h.p. at 2,700 r.p.m. for take-off, single-stage supercharging being employed. The top speed is given as 190 m.p.h. at 10,500ft., operating speed 179 m.p.h. at 7,800ft., alighting speed 69 m.p.h., service ceiling 24,000ft., and maximum range at operating speed 4,000 miles.

Armament consists of one rifle-calibre machine gun in the nose, one in a blast-tunnel beneath the tail, and two in each of two blisters on either flank of the hull amidships. Bombs or depth charges are carried beneath each wing on the centre section.

A24

Quality plus Design

SMITH'S
AIRCRAFT
INSTRUMENTS

IMPERIAL IMPROVISATION

How the Broken Empire Air Line Was Restored : 12,000 Miles in 23 Days Without Ground Services or Navigational Aids

FRANCE had fallen and Italy had stabbed her in the back. Thus almost without warning the Mediterranean was closed to British shipping and aircraft, and the Empire's air communications had been cut. It was necessary that they should be restored without delay.

Lying at her moorings at a South Coast port was the Royal Mail aircraft *Clyde*, of British Overseas Airways; an S.30 Empire flying boat, Commander, Captain A. C. Loraine. The flying boat was engaged on the then recently opened Atlantic service to the United States, and her Captain was preparing her for a voyage to New York. There were some hurried conferences in London and at 4 o'clock one afternoon Captain Loraine was called on the telephone by the Operations Superintendent and told that he must leave in the morning, not for the U.S.A., but for Lagos, in West Africa.

It should be explained that no flying boat had ever before made this voyage from the United Kingdom. But from West Africa across to Khartoum there ran the air route which had been pioneered by Imperial Airways in 1936. It was to link up with this service and thus to restore air communication between the United Kingdom and Egypt, India and the Far East, that it had been decided to establish a service to West Africa.

Those who are versed in aviation matters know that for the operation of aircraft on overseas voyages an elaborate and carefully planned organisation is necessary: harbours have to be surveyed for safe take-off and alighting areas; launches have to be provided and their crews trained in the delicate task of working with flying boats; refuelling facilities are needed; there must be meterological services and a wireless organisation to maintain touch with the aircraft during flight.

Even as far as Lisbon, the first stage of the journey to South Africa, few such facilities existed, and south of Lisbon they were completely absent. This provides a measure of the difficulty and dangers of the long voyage of some 5,000 miles which Captain Loraine was called on to undertake almost at a moment's notice. He had almost literally to fly off into the blue.

Next morning, with Captain May as his second pilot, and Radio Officer Cheeseman as the only other member of his crew, he left with eight important passengers. His orders were to get to Lagos with the utmost possible despatch.

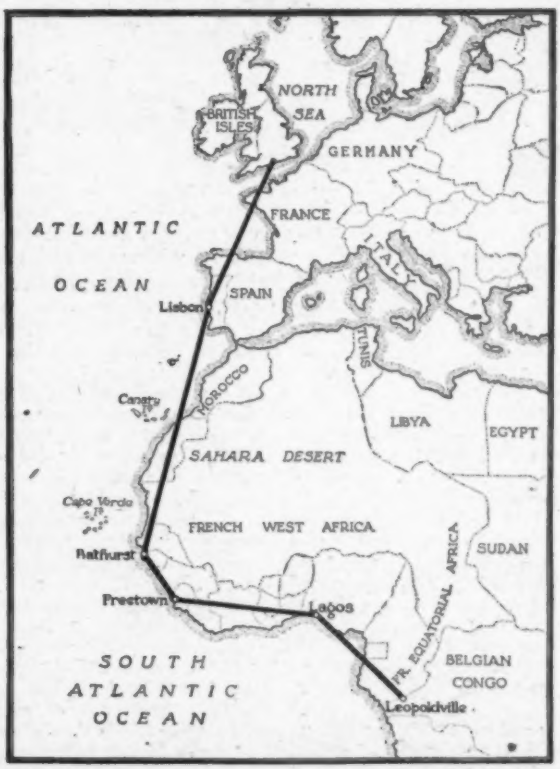
The first stage of the journey—some 1,000 miles to Lisbon—was uneventful, but *Clyde* was the first British flying boat to arrive at that port in transit, and difficulties arose in regard to the passengers. Evening had come by the time these difficulties had been smoothed out, but in view of the orders he had received, Loraine decided to leave at once. Having taken on board Engineer Officer Rogers, he accomplished a night take-off with an all-up weight of 53,000 lb. (about 24 tons) which he believes was the first time that this had been done with this class of aircraft.

Capt. A. C. Loraine, of British Overseas Airways, who skippered the *Clyde*.

He was just airborne when he discovered that the launch on control duty had not properly cleared the take-off area, and as a result a sailing ship loomed in front of him. Had he tried to land again, he would just have rammed the ship. On the other hand, he had not sufficient altitude or speed to make a turn. It appeared very doubtful, heavily laden as he was, whether he could even climb over the ship. However, as he approached, he managed to lift one wing, and apparently cleared the vessel.

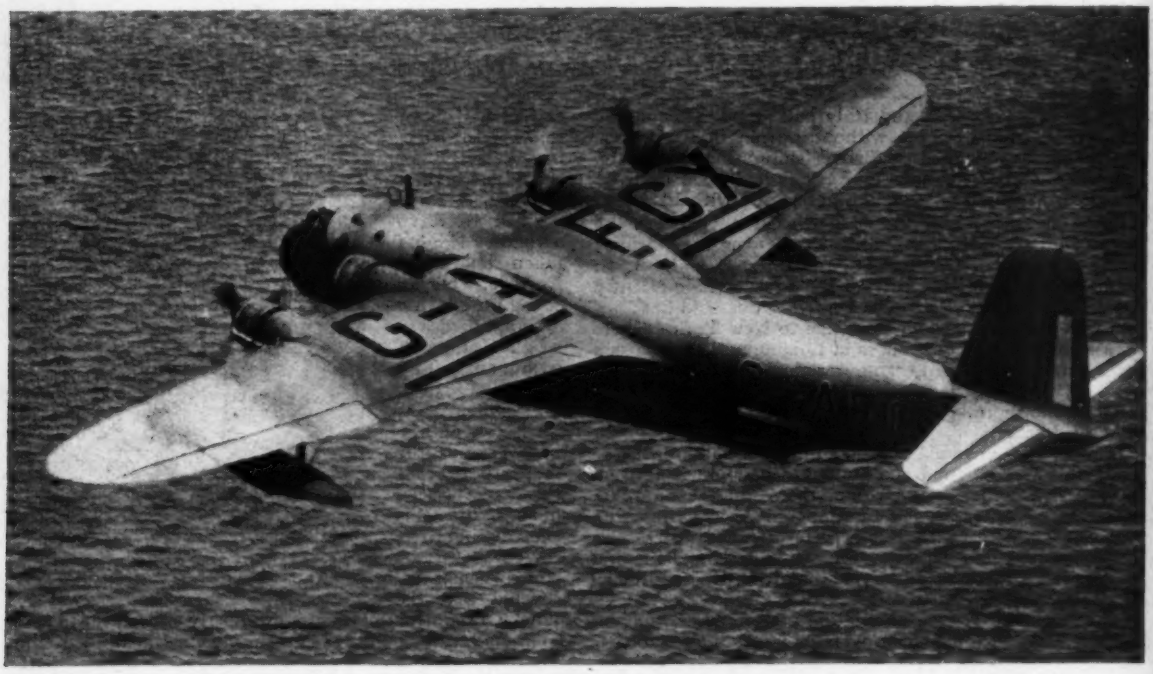
He flew on through the night to Bathurst, 1,900 miles away, a journey equal in length to an Atlantic crossing. It was the first direct flight which had ever been made from Lisbon, and he made his way purely by astral navigation. There was no radio; there was no weather forecasts, and, in fact, no weather reports of any kind. The weather, however, was excellent, and shortly after dawn he made a safe landing at Bathurst.

When he examined his aircraft there, Loraine made an alarming discovery. He found that after all he had not cleared the sailing vessel at Lisbon, but that the starboard wing had been struck by the mast and a whole section of the aileron had been torn out. They set to work to repair this damage, and were fortunately able to find a piece of aluminium which had been left there by the German air line, *Deutsche Lufthansa*, when war broke out. The Navy were very helpful, although the nuts and



Sketch map of the route taken by the *Clyde*.

IMPERIAL IMPROVISATION



The Short flying boat *Clyde* was taken off the Atlantic run at a moment's notice and sent to Belgian Congo. In spite of lack of ground facilities and other operational aids, the flight was successfully completed. The Bristol Pegasus engines kept working at oil temperatures of 110 deg. instead of their customary 70 deg.

bolts which they produced were hardly the type to which aircraft workers were accustomed, being of heavy brass!

The repairs were effected, the night spent at Bathurst, and the following afternoon Loraine went on 450 miles to Freetown, arriving there in the evening. There, a series of complications began.

He had sent a message ahead that he wanted to refuel that evening, so that he could be off at dawn the next morning. When he arrived, he immediately asked about the refuelling, and was told that all preparations had been made and that the barge was waiting. He asked to see the barge, and an enormous steel vessel of several hundred tons was pointed out to him approaching the aircraft. He immediately had urgent signals made to the barge to steer clear, as there appeared to be imminent danger of its ramming and sinking the aircraft. It was, of course, impossible to do anything more that evening, particularly as all the petrol was in heavy drums.

Refuelling Difficulties

The night was spent at the Army Mess at Freetown, and early next morning they again tried to refuel, but all seemed hopeless. There was no proper equipment, no pumps, no pipelines, and there was a five-foot swell running.

Loraine was told of a sheltered bay some way up the river where there was an old buoy. It was decided that a pennant should be fixed to this and that Loraine should taxi the aircraft to it, the lighter with all the drums of petrol being towed there. They arranged to make a survey of the ground that evening, and the local authorities offered a launch. Unfortunately, on the way, it ran out of oil, and the engine seized, but another launch was there and this towed them to the buoy, promising to pick them up later on its return journey.

In due course it arrived, approaching at high speed. It was unable to stop, and rammed and sank the boat in which Loraine was sitting. Apart from a wetting, however, there were apparently no ill-effects.

At 6 o'clock the next day, having taxied out to the buoy, they started refuelling. Huge drums of petrol were brought alongside in canoes, hoisted up and poured with a funnel into the petrol tanks. As soon as they had started it began to pour with rain, and during the whole refuelling, which lasted all day, Loraine's raincoat had to be held over the funnel, while he was soaked to the skin. They finished at half-past five, and during all that time, in continual rain and appalling heat, they managed to take on only 1,000 gallons. They then taxied back to the proper moorings, and early next morning got away, despite a very nasty swell, reaching Lagos, 1,300 miles away, that evening.

Bolts and Nuts

There a more permanent repair was made to the wing, although again steel bolts and brass nuts supplied by the Marine Department at Gambia had to serve.

Then Loraine received orders to continue to Leopoldville, in French Equatorial Africa, where, following events in France, a delicate political situation existed. This meant another flight of nearly 1,200 miles

The journey was uneventful, and *Clyde* landed on the Congo, being the first British aircraft to do so, but once there, fresh troubles began.

In the ordinary way, after a voyage of this length, engines would, of course, need a thorough servicing by skilled mechanics, but this was out of the question since no such facilities existed.

Immediately after *Clyde* left Leopoldville on the way back to Lagos, a fuel leak developed and there was trouble with a leaky oil cooler. These troubles were dealt with, but when he got to Lagos Loraine found that another air cooler was leaking. This, too, was repaired.

Then the homeward journey was begun, with the same passengers as on the outward journey, but while en route to Bathurst the automatic pilot went out of commission, and Loraine and his second pilot had to fly the aircraft by hand some 3,500 miles, day and night, back to England.

IMPERIAL IMPROVISATION

The flight of the *Clyde* was made without assistance from radio. In marked contrast is the duty room of British Overseas Airways, from which contact is maintained with B.O.A. aircraft flying in many parts of the world.

The flying boat was, of course, designed for use on the North Atlantic and not in the tropics, and many troubles arose in consequence. At times the engine oil temperature went up to 110 degrees instead of the normal 70 degrees, and Loraine feared that all the engines would give up. Fortunately they did not, and seven days after leaving Leopoldville the flying-boat touched down at a south coast port. They had been away 23 days.

In that time Captain Loraine and his crew had flown over 12,000 miles, equal to half-way round the world, over routes where no flying-boat had been before, without ground services or navigational aids normally considered essential for aircraft operation. Loraine was a sick man when he reached England. Having made his report, he went home and was put to bed. He stayed there for six weeks with malaria.

From that pioneer flight has grown the great air route to West Africa along which to-day British Overseas Airways flying-boats fly back and forth on their task of maintaining the overseas life-lines of the Empire. It is now continued across Africa by the 2,500-mile landplane route, developed from the original route pioneered by Imperial Airways in 1936, and also by the 3,500-mile flying-boat service now operated by British Overseas Airways up the Congo, both services linking up with the Corporation's Empire line from South Africa to Egypt and India.

"Bombing" at R.A.F. Exhibition

ONE of six travelling "R.A.F. in Action" exhibitions, which will shortly be visiting outer London for the first time, has a novel device by which visitors may release "bombs" at the press of a button. The exhibition was opened on Saturday, September 26th, at the Men's Institute, Page's Walk, Bermondsey, and will run until October 10th.

It was previously held in a famous West End store, and then visited blitzed Southampton, where many bombed citizens had the opportunity of seeing some of the devices with which the R.A.F. is hitting back at the enemy.

Another novel feature is a press-button aircraft-spotting device. On this amateur spotters can try their skill at identifying various types of aircraft flashed on to a screen.

A.T.C. cadets of the Bermondsey Wing were on parade at the opening ceremony with their own bands.

Topics of the Day

APTITUDE or APPLICATION?

In Favour of the Slow Learner : Time as the Great Improver : The A.T.A. Shows Up the Medicos : Making the Most of Talent

IN the matter of flying skill—if such a comparatively simple performance can be so described—time appears to be not so much the great healer as the great improver. So much so that I am now fairly well convinced that in nine out of ten cases those who take longest to learn turn out to be the best all-round pilots.

Infuriating though it must be for the *ab initio* instructor to have to deal with someone who seems to be the very last word in unteachable morons, he may possibly be able to comfort and strengthen himself with the knowledge that this poor stupid oaf of a pupil may eventually turn out to be the prize boy of the course. Needless to say, this is only a generalisation; there are people who are absolutely incapable of learning anything that demands reasonable reactions and clear judgment. But the good instructor should be able to tell the difference between the genuinely hopeless case and the pupil who is worth a little extra patience and time. The worthy duffer, for instance, may habitually hold off at ten feet and make the most stupendous mess of his approaches, but he doesn't panic and, more important still, can discuss his errors, knowing quite well that he is making them. The genuine duffer is absolutely in the dark the whole time.

I think that the too-apt pupil must be most carefully watched. Like the infant prodigy, he very rarely gets any further, for the good reason that he has never found it necessary to make an effort—and in all the later stages of flying an effort as well as a comparatively high standard of intelligence are required. The bright young man who dashes into the air after about four hours' dual—or could if he was allowed to—just doesn't find it necessary to try, and so loses the habit of trying. Like the young woman who is so naturally beautiful that she makes no effort to be interesting as a person and grows into rather a characterless creature, while the not-so-good-looking woman knows that she has a lot of leeway to make up and is reaching her prime when the vacant beauty, if she hasn't already caught her man, is beginning to lose her grip—if she ever had anything but a superficial hold.

Prodigies

At one time or another I've met quite a number of remarkable "natural" pilots who have taken to the air as some children take to the water. Hardly one of them has become in any way outstanding as a pilot, *per se*, though two or three have made magnificent fighting pilots. Yet I can think of dozens of very mediocre people who have gone all the way and are now first-class and really intelligent drivers of aircraft in a big way. Knowing their deficiencies, they have used their brains to make up for these shortcomings, and have consequently gone a great deal further in a modern flying world, where intelligence rather than sheer skill is required.

It is difficult to pick out examples in the Air Force, because the Powers That Be are not looking only for the sort of ability which makes a good pilot, but are expecting a whole lot of other characteristics in their G.D. officers or sergeant pilots. Quite a few of their most intelligent pilots are flying around in stooge jobs because their particular abilities are not needed. That's one of the unfortunate features of war conditions; the poet remains a private, the artist an A/C.2, and the author an O.D. Their abilities are not required during a war and they are being horribly wasted (from the rational viewpoint) as mere fodder.

The ability to fly any machine well and to get it where it is wanted is not very highly rated in the Service. There are plenty of sergeants and pilot officers doing the sort of job for which the airline pilot is given two or three rings and the salary of a surgeon or a Cabinet Minister. And, in most cases, there is no reason why they *should* be any more important or well-paid; they have been trained by the Government and are either incapable or unwilling to do the much less pleasant and more responsible job of looking after some thousands of men or of organising the layout of a new camp, or of planning a large-scale offensive. Those are the arduous jobs in wartime. I would rather be a junior officer in an aircraft than a senior officer polishing a seat for twelve hours a day, though it is a little hard on the elderly "juniors" who have brought their experience free to the Service.

All the same, I know of two extreme cases in the R.A.F. which help to prove my point. One was a brilliant pupil who was perhaps a little too successful as a fighter pilot; he avoided all arduous studies and really learnt no more about the business of flying. Eventually he was taken, for medical reasons, off Ops., and found that he had no place in the scheme of things. I believe he is now a not very efficient instructor at an O.T.U. and is certainly not getting anywhere. He avoids hard work, leaning on his laurels in the form of a now faded but well-deserved D.F.C., and, curiously enough, thinks he has learnt all there is to learn about flying. The spoilt prodigy in person.

Per Ardua

The other was a fairly stupid pupil and, according to one of his flight commanders, was extremely "ham," even when he reached a squadron, breaking aircraft unnecessarily through sheer bad judgment. But he was a trier and as keen as possible. Now, six hundred hours later, he has got the sort of job which suits him and is by way of being rather a crack on everything from fighters to four-engined bombers. Heaven help him if *he* gets the idea that he's learnt everything and stops using the brains which have saved him and made him into a good above-average pilot.

An organisation like the A.T.A. must carry dozens of people who, by sheer keenness and hard work, have made the pace. Most of the original crowd were well beyond the age which is supposed, so wrongly, to be the limit beyond which nothing can be learnt in this flying business. They joined this organisation because the Air Force had no use for them. At least half a dozen had even learnt to fly at quite an advanced age—as pilots' ages go—and drifted vaguely about for years in often ill-conducted light aircraft. Yet when they were faced with more complicated military types they were duly humble and used their brains.

Not one of them pretended that it was going to be an easy and pleasant job; they just got down to it, knowing their own weaknesses and with a good healthy respect for the knobbly new types with which they were presented. One, who was practically turned down during the initial tests is now, I believe, on the Atlantic ferry service. Two or three others, who were given nothing more exciting than Tiger Moths and Magisters to fly for the first few months of the war, were gradually encouraged into the seats of larger and larger machines until some reached the very top class. One or two were hurried on a little too fast, or were never really capable, temperamentally, of dealing with large types in difficult conditions, and accidents happened. But the general history of the A.T.A. proves that good, intelligent and mature people, however slowly they appear to be learning, get there in the end and can be very much more reliable than some of the brilliant pupils.

And the women. They went through their novitiate of

APTITUDE OR APPLICATION

Tigers for the better part of a year before anyone would trust them with anything else. Those in the know learnt that they were eventually being given conversion courses, but the average person's first intimation of their new status was the appearance of a Hurricane or a Spitfire on the tarmac out of which stepped, *mirabile dictu*, a female. Admittedly, most of the initial bunch of female ferry pilots were professional or semi-professional pilots before the war, and the others were very carefully chosen, but the best of them are flying twins now and nobody would be surprised if they started to turn up as captains of Liberators and things.

I have very little patience with those males who, through a sort of sexual jealousy or otherwise, find themselves unable to do anything but criticise the efforts of the women. The proof is in the results, and it would be more than stupid not to make use of the available talent. One thing is quite certain; nobody would have thought of introducing a flying branch of the W.A.A.F. The conservative Powers would never have stood for it. Only now, after three years of war, are the women in this branch of the Service being offered anything but the very stoogiest of jobs as an incentive. Whether clever or otherwise, they were made into cooks, clerks, cipher officers, and women-to-look-after-women. The women's Services were planned on the basic thought: "A woman's place is in the home, but to save manpower we will allow them to do a few unpleasant little jobs for us and give them a uniform."

Women have, I suppose, rather asked to be treated as nonentities. Even after their "emancipation" only the exceptional one in a hundred really tried to do anything very much. Which is not really very surprising considering their nature and outlook. You can't change the nature of things, but you can throw away all conventional ideas and be prepared to make the absolute most of available talent, whether male or female.

By now, the R.A.F. has pretty well accepted the A.T.A., though they still tend to be angered by certain minor anachronisms. Those who will not accept them can remember that every one of the A.T.A. pilots could by now be flying either in the R.A.F. or the W.A.A.F. (!) if there'd originally been any room for the thirty dead-beat pilots who formed the nucleus at the start of the war. The organisation of the Air Force was too inflexible to take them on as anything but office boys. Perhaps the inflexibility was inevitable, and nobody is to be blamed, but there it was—and the talents of the nucleus were duly considered by somebody else. It doesn't matter how or why or for whom—they're doing a real job.

And if ever the Air Ministry feel the need for some more stooge pilots they'll find quite a few amongst the adjutants and engineer officers and Link trainer instructors. People with a few hundred hours in light aircraft who joined up at the beginning of the war, but who, because of minor physical disabilities, were never given the chance for which they craved. The A.T.A. has shown that the halt and the maimed can do a useful flying job and that a man doesn't need to be a hundred per cent. fit to be able to do non-operational work in the air.

"INDICATOR."

MAKING THEM TOUGH

Gruelling Assault Course for R.A.F. Ground Staff

THE R.A.F. Army Co-operation Command has opened a school which has, as its main purpose, the toughening of its non-operational personnel.

Men who a few months ago were shop assistants, bank clerks, tram drivers, cobblers and so on, and who are now R.A.F. clerks, fitters, armourers, policemen and other ranks, spend several days on this course, and at its conclusion feel fitter than they have ever felt before.

After a few days' preliminary training in the handling of firearms, they are put through a gruelling assault course during which they have to negotiate under fire a series of obstacles which include pits and ditches, wire entanglements, streams, rope-bridges, ladders, and palisades.

If the trainees are at all slow in getting through the barbed wire or over the rope-bridges, they have a bomb thrown at them which, although harmless, is more than a gentle reminder that in actual warfare they would have been dead long before they had crossed over. If they should fall in the water another bomb awaits them which sends up a cloud of spray, ensuring that they are drenched from head to foot. The water bomb is a penalty for bad negotiation.

Having run the course, which is well over a mile in length, they are expected to be sufficiently in breath to charge the enemy and take aim at him.

Another part of the course teaches them to outwit the enemy. At a recent manœuvre they succeeded in capturing a hillock and at the same time took such excellent advantage of the natural cover that they were able to carry out the attack without being seen, either by the judges or the "enemy."

Air Marshal Sir Arthur S. Barratt, Air Officer C.-in-C., Army Co-operation Command, recently paid a visit to the school and expressed approval of the progress made by his men. He noticed that they were tackling this offensive-minded job with an enthusiasm and efficiency equal to that shown by operational members of the R.A.F.

MONKEY BUSINESS: Exercises such as this help to make R.A.F. ground staff into tough fighting men.

PLASTICS and AIRCRAFT

Part III of an Article on Their Composition, Manufacture and Application

By W. NICHOLS, A.R.Ae.S.

AMONG many components now being made of resin-bonded plywood are fuel tanks, and these appear to give promise of being used to a more considerable extent in the future. Another use of plywood by the aid of a similar process to the "Vidal" or "Duramold," described is the method known as "Plastiply."

"Plastiply" differs in no way from plywood as a material but is a mechanical method of fabrication for structures. So far this system has not been adopted commercially, but work is progressing for a number of uses in

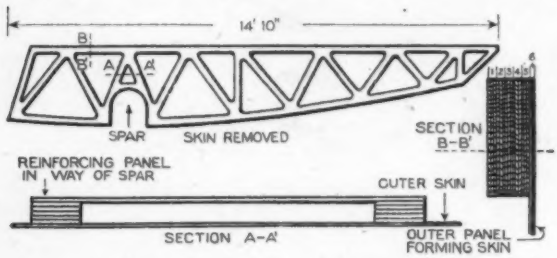


Fig. 3. The fuselage side of a light trainer aircraft, fabricated by the Plastiply process. It will be noted that the fuselage has been designed for use with a single tubular wing spar. The veneers normally used would be of thinner material and greater in number. A fuselage on the geodetic principle could be produced with advantage by this process.

the aircraft industry, chief of which are a complete fuselage side-frame for trainer or glider aircraft and light transport machines; other uses are wing spars, bomb beams, etc.

To illustrate the process, a fuselage side designed on the Warren girder principle is shown in Figs. 3 and 4. A template for use with a "router" is first required. Plywood sheets of suitable thickness are then clamped together and to the template. When the required cross-sectional area at all points of the frame has been obtained, the sheets are cut to the template on a Wadkin radial-arm router-cutter. The radial arm is specified as this will obviate the necessity of moving the work. For large areas two or three of these router-cutters could be employed. A reproduction showing the "business end" of these machines was published in Part II. By this means the fuselage frame for both the port and starboard sides can be produced in one operation, and there are no end joints to be considered for the struts nor additional fittings, the whole frame being cut to the profile of the template in the form of a girder.

In the next operation each side-frame is treated separately by a process similar to the "Vidal" or "Duramold" already described, and in most cases it will be necessary for the frames to have some degree of curvature to give good streamline form in plan view when assembled. This is also obtained by a suitable mould. The result is, of course, that the numerous veneers are bonded together into a solid homogeneous mass, the greatest thickness being where the strength is required most (see Fig. 4).

The top and bottom bracing panels are produced by the same means, floors, etc., being included in the latter, then assembled to the side-frames, synthetic resin glue being used for the purpose. The outer skin of the fuselage side can be formed by the outer veneer. The most attractive feature of this fabricating process is the rapidity with which a complete fuselage can be produced with a minimum amount of labour.

Apart from the various processes already described, it now seems possible to produce by the moulding process certain structural sections more or less reminiscent of built-up metal sections. A variety of these are shown in Fig. 5, in which the angular and channel sections would be moulded and built up to the required thickness.

For Larger Types

The process just described for producing a complete fuselage side would, of course, be limited in its application to lighter aircraft, trainers or troop transport gliders of the smaller type. By a combination of this process, however, and the built-up sections shown in Fig. 5, the process might be found convenient for construction of aircraft of larger overall dimensions. A new plywood material has recently been produced in America by the trade name of "Compreg," which is credited with metal-like strength, but no

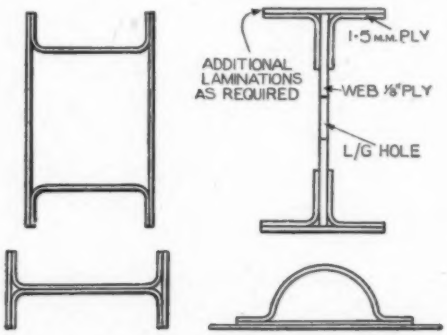


Fig. 5. A selection of built-up structural sections, reminiscent of metal work, which, it is suggested, could be fabricated in moulded plywood bonded by synthetic resin glues.

further details have so far become available. The strength of approved synthetic-resin glues used in the process, according to British specifications, must not be less than 1,100 lb./sq. in. in shear. Resinous glues do not "set" properly below 70 deg. F., and all work, therefore, should be done in air-conditioned rooms.

From what has been written, it appears that the new fabrication methods permit of wood-plastic construction becoming more simple and rapid than metal in many cases. Components can already be produced at reasonable cost, and as new and cheaper jigging methods become available the cost can be further reduced.

This substitute, however, must prove capable of producing parts of equal or even greater strength, and at no increase in weight, and it certainly appears from results obtained, chiefly in America, that this is becoming possible. For example, it has been claimed that the use of wood-plastic construction for the floors of a large transport aircraft saved over 120 lb. in weight.

There is, of course, still room for development, and one item that still needs looking into is the abolition of the metal fittings that still appear necessary where main structural joints are required. This may be overcome to some extent by providing plastic

Fig. 4. Sketch showing how, in the Plastiply fabrication process, the plywood panels are gradually reduced in number towards the tail as strength considerations permit, thus economising in cost and weight.

PLASTICS AND AIRCRAFT

inserts cemented to the wood structure to obtain the necessary strength in "bearing."

As an example of what this plastic-wood construction can mean in wartime, it has been estimated in the U.S.A. that approximately ten million pounds of aluminium can be saved for more important duty by the substitution of wood-plastic components wherever possible in Government contracts. If this is the case, the development of wood-plastic construction in this country should immediately receive every encouragement from the Government and manufacturers.

The use of synthetic resins with fabric has been very successful in certain directions, and like plywood and plastic-wood, these materials are being put to good use. Hopes were entertained at one time that cellulose-acetate with a fabric base would provide an ideal material for the aircraft industry, and it has, in fact, been extensively used for the manufacture of various components, including fuel tanks. From practical tests, however, it has not proved to be entirely satisfactory as it has a high moisture content and is apt to de-laminate after a period. Another plastic has been found to be superior, having a fabric base. Fuel tanks of this material appear to stand the test satisfactorily, and may soon be in production.

The Fairchild AT-13 trainer has now undergone successful test flights. It is built on the "Duramold" process decribed in last week's issue.

A Paper Base

One very promising plastic produced in this country is "Pytram." This has a paper base, and for some time suffered from the fault common in so many of the plastic combinations, viz., a high moisture content. Experiments carried out by the Royal Aircraft Establishment have overcome this defect, and "Pytram" now has an outer fabric covering which undergoes certain treatment.

At the moment this material does not appear under a D.T.D. or other specification, but in view of its great possibilities this may be remedied in the future. Components made by this process are built up layer by layer on wooden moulds, the plastic adhesive being in a "tacky" condition during this stage. Originally produced for lightly stressed parts, its use for more important structures appears possible. Electric conductivity is "nil" but it can be metallised in cases where components need to have an electric field beneath them. Components which present a problem in sheet metal are frequently produced in "Pytram." As with most plastic materials the tooling costs in production are low and with this material a saving in weight and cost seems probable.

This American two-seater glider, designed and built by Bowlus Sailplanes, Inc., of California, is built of plywood bonded with phenol and urea moulded under hot and cold pressure.

From the result of tests carried out by the Royal Aircraft Establishment investigating the possibilities of "Pytram" as a structural material, the following properties are claimed:—

Density, 4 lb./cu. ft.
Specific gravity, 0.77.
Tensile strength, 3,900 lb./sq. in.
Bolt-hole tensile strength, 4,020 lb./sq. in.
Shear strength, 2,000-3,000 lb./sq. in.
Temperature range, satisfactory from −70 deg. C. to +130 deg. C.
Water absorption, 1.92 per cent.
Modulus of rupture bending, 5,960 lb./sq. in.

Plastic Application to Airscrews

Plastics are, in addition, now assisting the manufacture and production of airscrews When adjustable and variable-pitch airscrews were in the experimental stage, natural wood was found to be unable to withstand the stresses at the blade root, and as a result metal blades were developed. The last few years, however, as a result of research and development, have again seen the wooden airscrew blade come into its own, due to the combination of laminated, impregnated and compressed boards, shaped in profile and glued together by plastic adhesives. Detailed descriptions of this type of blade have already appeared in *Flight*, and, therefore, need not receive more than brief mention here.

Among the best known and most used of these processes is the Rotol-Jablo blade. These detachable blades of reinforced wood receive a special finish known as the Jablo Covering, which consists of a phosphor-bronze gauze embedded in synthetic resin. After ovening and sanding, further coats of this resin are applied. Another form of covering, known as "Rotoloid," consists of a cellulose nitrate sheet 0.04in. thick all over the blade. When treated by this method the wood blade is left rough but to the correct profile allowing for the thickness of the covering. This roughness improves the adhesion of the cellulose-nitrate sheet.

These sheets are by means of a plasticising bath reduced to a pliable state. The blade itself is given a coating of clear cellulose dope on the curved face, and on the leading and trailing edges. The sheet, when removed from the bath, is dried and rapidly squeezed on to the surface of the blade and trimmed. Plastic cellulose is used to seal up any space left after both sides have been covered.

PLASTICS AND AIRCRAFT

The blade then stays in a warm room for 24 hours to dry out most of the solvents. The process is again repeated on the pitch face of the blade, which ensures a double thickness of cellulose sheet at the leading and trailing edges, beneficial from the erosion point of view. The blade is then thoroughly dried out in a hot room for 72 hours, after which it is sprayed matt black with cellulose paint and rebalanced.

When fitting the adaptor or steel sleeve to the blade root, synthetic resin glues are used to act as a lubricant and to enable the taper of the adaptor to get a firm grip on the wood. Cellulose-nitrate discs attached with cellulose dope and having a stiffening ring of the same plastic is sometimes used to seal the root and prevent change of moisture content in the wood.

Schwarz Process Used

Another well-known process is that used by the Airscrew Company. In this, two types of protective covering are used, one being the Schwarz patent finish. The blades themselves are made by a somewhat similar process to that already described, and may be referred to briefly as compressed wood. Spruce is used for the blade tip, but from strength consideration a special impregnated hardwood known as Samsonow is used for the root. The spruce is usually in laminations of $\frac{5}{8}$in. thick, but the Samsonow is manufactured from a number of $\frac{1}{4}$in. birch laminations treated with synthetic resin. The sheets are then bonded together under hydraulic pressure of $1\frac{1}{4}$ ton/sq. in. at a temperature of 155 deg. C. After the sheets are sawn to width the pieces are joined to the spruce boards by a special casein glue, and the various operations of machining the root and profile are carried out.

The first stage of the covering process consists of perforating the blade surface with deep pin pricks by the aid of a roller. Cotton fabric is wound around the blade and a leading edge of brass sheet sweated to copper gauze is lightly tacked in position.

The complete blade is covered with a wrapping of plastic cellulose-acetate in the form of a pliable sheet. The blades are then placed in a rubber bag and the air from it withdrawn, leaving the rubber in close contact with the blade surface, and forming a perfectly fitting rubber mould. The next step is placing the bag inside an autoclave where it becomes subjected to air pressure of 85 lb./sq. in. for several hours. During the process the cellulose covering is forced through the cotton fabric and into the perforated blade surface. When the blade is withdrawn the surface is very hard and, after trimming, a special mixture is painted over the blade to fill the pores. An alternative to this process, used by the same company, is the Rayoid, which employs cellulose nitrate in place of cellulose-acetate.

In this process the cotton fabric and metal leading edge are not used, the blade, therefore, being much lighter. The surface hardness is equally good and the covering rather more elastic. This process has been very successful in use and dispenses with the rubber bag during manufacture, a rather important factor in these days of rubber shortage.

From what has been written it is clear that plastics in some form or another are already finding a prominent place in the aircraft industry, and as time goes on and the results of present research and development with these materials progresses, a more extensive use of plastics will take place. Due to the war this progress is likely to be very rapid and possibly in the sphere of aeronautical engineering "plastics" may be one gift of the War God to Peace, and Civil Aviation.

THE SEA RANGER

First Naval Aircraft Produced by Boeing Since 1933

ALTHOUGH detailed information may not yet be published, a few more particulars have come to hand concerning the new Boeing Sea Ranger, a photograph of which was published in our issue of July 30th, 1942.

The official U.S. Navy designation of the Sea Ranger is the XPBB-1, which indicates experimental patrol bomber, Boeing. Not since 1925 has the Boeing plant at Seattle produced a Naval flying boat, although many clippers have, of course, been built for Pan American Airways. In 1933 the company built an experimental carrier fighter, the XF7B-1, but this was a landplane.

In spite of being of the twin-engined type, the Sea Ranger can be regarded as being in the weight class of four-engined aircraft, for its two 2,000 h.p. Wright Cyclone engines enable it to get off with a very heavy load.

Designed for long-range patrol work over the open sea, the Sea Ranger carries bombs in addition to its defensive armament which, as the photograph shows, includes nose and tail turrets, a gun position on top of the hull, and "blisters" on the beam, aft of the wing. No figures may be published, but it is obvious from the picture that the wing loading must be high, the wing looking almost ridiculously small in proportion to the hull.

When on extended operational flights, the Sea Ranger has living accommodation for a crew of ten.

The Sea Ranger on its first test flight over Lake Washington, Seattle.

BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Luftwaffe Tank-buster?

WITHOUT giving precise details, neutral sources persist in reporting the appearance of a new German aircraft type on the Russian front. The aircraft, presumably a Henschel, is a "tank-buster" and is said to be heavily armoured and equipped with an anti-tank gun firing armour-piercing shells.

Changes at Vichy

DURING the recent reshuffling of the command of the Vichy Air Force, the portfolio of Minister for Air also changed hands. It was given to Divisionnaire-Général Jannekeyn, who has been connected for many years with the French Air Force. He replaces Gen. Bergeret, who was put in charge of anti-aircraft defences with the rank of Inspector General of A.A. Defence (Défense Aerienne du Territoire (D.A.T.)).

Hitler's Air Adviser

A VEIL of strict secrecy shrouds the field H.Q. of the Nazi Fuehrer. Their whereabouts and composition are a mystery even in Germany, known only to a few chosen, but despite rigid measures to keep the secret it can be assumed that the Fuehrer pitched his tent somewhere in the neighbourhood of Kiev. Composed of a crowd of 200 serving personnel, 100 S.S. body guards, 18 men in charge of a cinema, numerous signallers, and 50 members of his staff, these H.Q. are the hub of the Nazi offensive.

Of the Nazi personalities attached to Hitler, perhaps the least known to the general public is Gen. Bodenschatz. Yet his position in the closest circle of Hitler's military advisers is very powerful. Gen. Bodenschatz is Goering's right-hand man, and is the representative of the *Luftwaffe* in the Fuehrer's H.Q. It is he whom Hitler consults on all matters connected with air warfare in Russia and elsewhere.

Not only does he act as a link between Goering and Hitler, but, being the senior member of the *Luftwaffe* in Hitler's "close circle," he is reputed to have an important say in planning the campaign, and is also Goering's "confidence man" to watch over the interests of the *Luftwaffe* among the tangle of Nazi politics. In some circles he is, in fact, regarded as Goering's successor.

Another member of the *Luftwaffe* who is in close contact with Hitler is Hans Bauer, his personal flight captain. Bauer has been on the job for quite a number of years, and is now assisted by a younger pilot seconded from the Moelders fighter squadron. The aircraft employed for Hitler's personal use are a special model of a Messerschmitt and a Fieseler Storch for short flights, usually flown by the younger pilot.

To Save Nazis

THE provision of a dinghy in bomber aircraft operating over large expanses of water is to-day a part of standard equipment. Pictures on this page show the type of rubber dinghy used by the *Luftwaffe*. German bombers such as the Dornier Do.215, Do.217, Heinkel He.111 and the Junkers Ju.88, operating in the Mediterranean war zone, carry a rubber dinghy in a container placed in the top of the fuselage, near the leading edge of the wing.

The container is armour-plated, with the cover forming a part of the fuselage skin. In an emergency this cover, operated from the crew compartment, can be jettisoned and the valve of the air flask opened; the inflated dinghy then emerges automatically from the container, and can be drawn towards the aircraft by a connecting cable.

Future French Engines

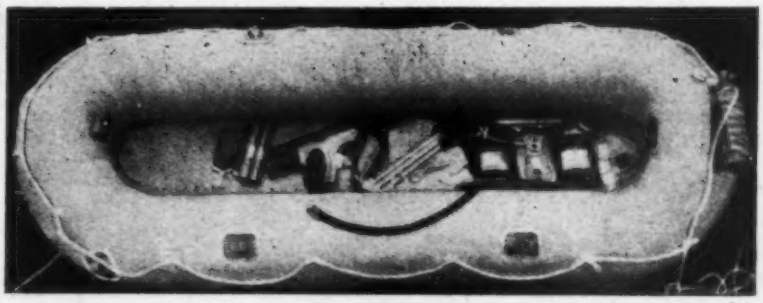
THE possible trend of French research work in the development of power plants for aircraft was revealed in a lecture given at Lyons. The lecturer did not consider jet propulsion likely to be adopted by the French industry in the course of the next few years. In his view, which can be taken as representing that of the French experts, the limited output per cylinder will unavoidably lead to the increase of cylinders up to 42 for high-performance engines.

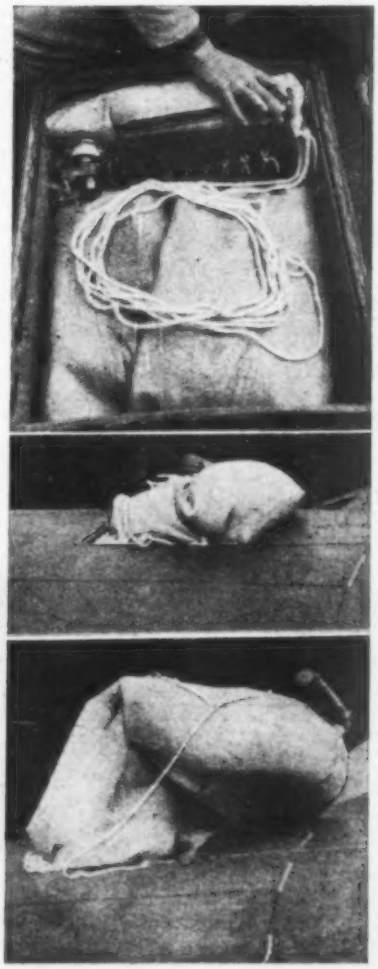
The power output of such engines is estimated at 60 h.p. per cylinder, amounting together to about 2,500 h.p. This will necessitate the provision of airscrews of a very large diameter, and to reduce the blade tip speeds a co-axial, oppositely rotating airscrew arrangement is suggested.

For higher power output the coupling of two engines jointly driving a pair of oppositely rotating airscrews is considered suitable. The arrangement of engines could be either in tandem, in which case each engine drives one of the airscrews, or mounted side-by-side. In this case it is thought that a better transmission of power can be effected by common gear and distributed among the two airscrews.

The adoption of two-stage multi-speed superchargers is advocated, while the possibilities of the exhaust turbine-driven supercharger are held to be limited on account of the back pressure of the exhaust gases impairing the cylinder charge. In the opinion of the lecturer, beside the supercharger, the drawing off of the exhaust gases by means of a blower should be considered.

Direct fuel injection into the combustion chamber is viewed rather sceptically, and thought to offer no decisive advantage, but the suggestion was made to transfer the carburettor to the compression side of the supercharger.





GERMAN DINGHY: Above, the inflated dinghy with the flask of compressed air; on the right at the top, it is shown neatly folded in the container with the operating cable. The two lower pictures show the dinghy being gradually inflated and emerging.

QUIET BIRDMEN

Tribute to Pilots of the Battle of Britain : Distinguished Allied Leaders Among Dinner Guests

QB, NOT to be confused with the International Code QBI, is not a signal. It is an order; an ancient order judged in aircraft development. Founded in America in January, 1921, for airmen of the Great War of 1914-1918, the membership, which includes many British, is defined in the terms of the membership card:

> The bearer is a member of ye Ancient and Secret Order of QUIET BIRDMEN.
> *founded January* 1921
> and is a certified goodfellow. He has mounted alone into the realms beyond the reach of keewee and modock and should be accorded all gestures of friendship and aid by fellow Quiet Birdmen wherever they may meet.

Thus came about the happy idea of a London Hangar QB to give a dinner in London to pilots in the Battle of Britain, and a very distinguished gathering attended the Savoy Hotel last Thursday evening. Among those present were:

Chairman: COLONEL JAMES FITZMAURICE. *Committee:* ADMIRAL RIISER-LARSEN; LIEUT. COL. LARRY HICKHAM; MAJOR MILTON TURNER; MAJOR FRANK CROWLEY; MR. J. C. WELSCH; MR. S. LINDSAY.

List of Distinguished Guests: H.E. Mr. Winant (*U.S.A. Ambassador*); Air Chief Marshal Sir Hugh Dowding, G.C.B., G.C.V.O., C.M.G.; Air Chief Marshal Sir Wilfred R. Freeman, K.C.B., D.S.O., M.C.; Air Marshal Leigh Mallory, C.B., D.S.O.; Air Vice-Marshal Sir Chares Janousek; Lieut. General D. D. Eisenhower; Major General Carl Spaatz; Brig. General James Doolittle; Brig. General H. S. Hansel; General Chauncy; Ujejski; Wing Cdr. Sir Louis Greig; K.B.E., C.V.O.; Wing Cdr. A. G. Malan, D.S.O., D.F.C.; Wing Cdr. J. London, D.F.C.; Wing Cdr. J. Rankin, D.S.O., D.F.C.; Sqn. Ldr. Tony Bartley, D.F.C.; Wing Cdr. B. Kingham, D.F.C.; Sqn. Ldr. K. Deere, D.F.C.; Wing Cdr. J. Kent, D.F.C., A.F.C.; Wing Cdr. Richard Gleed; Sqn. Ldr. D. Watkins, D.F.C.; Wing Cdr. T. Thomas, D.S.O., D.F.C.; Wing Cdr. P. Green, D.F.C.; Grp. Capt. J. Peel, D.S.O., D.F.C.; Sqn. Ldr. Dundas, D.F.C.; Sqn. Ldr. J. Johnstone, D.F.C.; Grp. Capt. J. Grandy; Sqn. Ldr. P. Ritchie, D.F.C.; Sqn. Ldr. R. Frankland; Wing Cdr M. Aitken, D.S.O., D.F.C.; Grp. Capt. R. Lees, D.F.C.; Grp. Capt. Grice, D.F.C.; Wing Cdr. W. Clyde, D.F.C.; Wing Cdr. J. Walker, D.F.C.; Sqn. Ldr. C. Milling, D.F.C.; Grp. Capt. B. Embry, D.F.C., A.F.C.; Wing Cdr. K. Holden, D.F.C.; Grp. Capt. R. Atcherley, A.F.C.; Wing Cdr. Boyd, D.S.O., D.F.C.; Grp. Capt Oliver, D.S.O., D.F.C.; Wing Cdr. Aste; Sqn. Ldr. C. F. Gray, D.F.C.; Flt. Lt. Dunning-White; Wing Cdr. Gillam, D.S.O., D.F.C., A.F.C.

The Chairman, Col. James Fitzmaurice, proposing the toast of "Our Distinguished Visitors," observed that in the U.S. a QB Hangar exists in every city or town where 25 or more QBs are available, and will play a big part in shaping the world of to-morrow. With the entry of the U.S. into the war he felt, as an old QB, that a London Hangar of this excellent organisation should be instituted and that it should include in its ranks pilots of this and Allied nations. It is the opinion of QBs that this war will bring about some sort of a confederation of the United States and the British Empire. The London Hangar of QBs, therefore, must in time be regarded as one of the foundation stones of that great amalgamation of liberty-loving peoples. This fact we can appreciate all the more when we consider the enormous part aviation is bound to play in shaping the people of to-morrow. Looking back into the past he saw the familiar faces of those distinguished and exalted officers of the Royal Air Force who filled his young heart with awe and a feeling of fear and trembling something over 20 years ago. They are the familiar faces of those who planned the Battle of Britain long before the Hun decided to release again four foul Horsemen of the Apocalypse upon what up till then we had regarded as a rather peaceful and happy world. He recalled those awful days of financial stringency which followed upon our victorious termination of the last war—"awful" because our great aerial leaders were forced helplessly to look on the reduction of that sturdy young weapon which they had so painstakingly created—the Royal Air Force—from the position of place Number One to that of Sixth, in terms of World's Air Power.

Undeterred by the grim shadow of the Treasury's whittling axe, hitting out in every direction, they waged a sterling battle to ensure, at least, the provision and maintenance of the highest quality in the world of both personnel and equipment in the remnant of that great Service.

Fighter Command

The vision, determination and unselfishness of our Air Force leaders then formed the rough stamping from which was forged that beautifully tempered rapier—the Fighter Command—which delivered the death blow to Goering's ugly ducklings a couple of years ago.

Of these great leaders they were proud to have present that gallant gentleman whose name will go down to history and be remembered equally with that of Drake and Nelson—Air Chief Marshal Sir Hugh Dowding (cheers). Chief of the Fighter Command in the days of 1940, it is to him, more than to any other single individual, that we owe so much when we realise how serious was the situation in the country after the collapse of France. It is due to his development of the Fighter Command that England still stands as that great bastion of freedom in which the might of Allied power is rapidly gathering to deliver the death blow which will destroy for all time that foul and loathsome thing represented by Nazi ideology.

With that great name we must couple that of another of our most distinguished guests—Air Marshal Leigh-

SOME OF THE "FEW" FROM THE BATTLE OF BRITAIN:

(Left to right) Sqn. Ldr. A. C. Bartley, D.F.C.; Wing Cdr. D F. B. Sheen, D.F.C.; Wing Cdr. R. Gleed, D.S.O., D F.C.; Wing Cdr. Max Aitken, D.S.O., D.F.C.; Wing Cdr. A. G. Malan, D.S.O., D.F.C.; Sqn. Ldr. A. C. Deere, D F.C.; Air Chief Marshal Sir Hugh Dowding; Flt. Officer E. C. Henderson, W.A.A.F., M.M.; Fit. Lt. R. H. Hilary; Wing Cdr J. A. Kent, D.F.C., A.F.C.; Wing Cdr. C. F. B. Kingcome, D.F.C.; Sqn. Ldr. D. H. Watkins, D F.C.; and W/O. R. H Gretton.

Mallory. It was his capable hand and cool brain which directed the rapier thrusts which found the chinks in the armour of the beast and sent him scuttling back to his French bases —wings and fuselages full of holes, ailerons shot away, engines smoking and dripping glycol and undercarriages dangling—the retreating remnants of a shattered and disorganised armada which left nearly 2,500 of its aircraft smoking heaps of wreckage on the English countryside—a useful contribution to our metal shortage at that time.

He regretted that Air Marshal "Billy" Bishop at the last moment could not attend and observed was it not the Bishops, the Balls, the McCuddens, and last, but not least, the great Micky Mannocks, to mention just a few, who laid the foundations of the high traditions which stood to us in our hours of trial between August 8th and October 31st, 1940.

Bishop was still spared to us. He has done much to create the high standards of fighting efficiency and daring so well displayed by the gallant gentlemen of the great Dominion of Canada who have stood shoulder to shoulder with us since the struggle began.

One of the many dumps of wrecked German aircraft so frequently to be seen in 1940.

His Excellency Mr. Winant had honoured the company with his presence. In the last war he was still quiet and one of the finest pilots. He recalled him sampling an SE5 and bringing it back in one piece. He mentioned General Spaatz, Brig. General Doolittle (the Japs don't like him), and then gave the toast of the Battle of Britain Boys and the 375 of their comrades who fought so gallantly. England and the whole civilised world owed them a debt which never can be repaid.

Former Chief's Tribute

Air Chief Marshal Sir Hugh Dowding, G.C.B., G.C.V.O., C.M.G., in responding for the pilots, praised their fortitude and consistent gallantry that brought us through those dark days. They knew not the meaning of fear. They were not all supermen that parried the invaders; some of them were workaday pilots pulling together as one great team and without letting up. He spoke feelingly of the fighter boys and their huge task. He said he regarded them all and treated them all as if they were his own sons (actually his own boy was with them). Not a life was wasted. They fought for everything we hold dear. It was not generally realised that the R.A.F. had been intensively engaged since the previous May. Dunkirk took a heavy toll. He hoped the idea had been dissipated that little was done by the R.A.F. at Dunkirk. Actually it was a terrific strain. There was no sort of respite before the serious fighting began in August and September. He paid tribute to the Czech and Polish pilots and remarked on the deadly hate of the enemy with which they went into action. As a guest he thanked QB, but he tendered more thanks to the American people for their practical help in many ways, and he coupled the Eagle Squadron with that tribute. The moral and material help of the U.S.A. was not generally realised. Actually they stripped themselves of aircraft to satisfy our urgent needs. At one time there was only one Fortress left, so anxious were they to provide all the bombers we needed. He related one amusing episode following the capitulation of France. A major-general visiting an Army unit remarked to an orderly he knew, "Johnson, this is terrible." The reply was "Don't know, Sir; we're in the final and we're on our own ground!"

Major General Carl Spaatz (Commanding U.S. Army Air Force, European Theatre of Operations) supported Sir Hugh Dowding, and briefly remarked that he was impressed with the ease with which the U.S. Army Air Force and the R.A.F. got together and spoke the same language. He was confident that the spirit of ready co-operation would continue until war is won.

Air Marshal T. L. Leigh Mallory, C.B., D.S.O., A.F.C., said those who fought in the Battle of Britain laid the foundations of success in this war. Gradually we were building up offensive technique on a solid basis, that is, all together and including all the Allies. It impressed him that the confraternities had come together better among the air forces than anywhere else. He found nothing easier than working with the Allied generals. This inspired great hopes for the future and the possibility of all building together after the war and a just settlement of the peace.

Brig. Gen. James Doolitle (attached to the staff of General Arnold, of the U.S. Air Force), received with enthusiasm for his Tokio exploit, spoke very briefly, pledging himself to do everything possible to co-operate with Britain and to do all possible to maintain the high standard set by the Royal Air Force.

Admiral Riiser-Larsen (Commander-in-Chief, Royal Norwegian Air Force) praised his men for their job at Dieppe. "Stand Together" was his watchword for the Allies. He felt they could not be in a better country. He thought of Kipling's words:

> "Our England is a garden,
> And such gardens are not made
> By singing 'Oh, how beautiful!'
> And sitting in the shade."

Let us fight to get our countries back again.

Air Vice-Marshal Sir Charles Janousek (Inspector-General of the Czech Air Forces), returning thanks, said, "Let us together finish this war successfully."

General Ujejski, K.C.B., of the Inspectorate-General of the Polish Air Forces, said the Battle of Britain was really a battle for power and honour. Let attack now take the place of defence. He looked forward to opportunity to disprove that lie of Goering that the Polish Air Force had ceased to exist, a lie as fat as Goering himself. He expressed gratitude to the Allies for the collaboration and sympathy they have enjoyed over here.

Passing of an "Atlantic" Pioneer

CDR. KENNETH JOHN MACKENZIE-GRIEVE, A.F.C., who was navigator to Harry Hawker in his attempt to fly the Atlantic in May, 1919, died in New York on Saturday.

Flying a Rolls-engined Sopwith, they suffered a choked cooling system which caused the engine to boil away its water, but were lucky enough to sight a Danish steamer, which rescued them in mid-Atlantic.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

FLEET FIGHTER PERFORMANCE

Fiats' Advantage Over Fulmar

IN his letter in *Flight* of September 17th, Mr. G. S. Henderson attacks my suggestion that manœuvrability is worth extra armament, but does he offer any alternative explanation in the particular case mentioned? If the reason for Fiats shooting down Fulmars is not superior manœuvrability then perhaps someone would suggest a different one.

Mr. Henderson appears to miss the whole point by his repeated references to armament and structural qualities. He does not appreciate the fact that a pilot may have a lot of guns and not get a chance of using them. A burst on the target is worth any amount in the air

Also, the answer to the question does not lie in the Battle of Britain. There was no one aircraft during that period which had definitely better manœuvrability than any other. Stripping an aircraft of a few guns does not give it an advantage such as the Fiat has over the Fulmar.

How great that advantage is Mr. Henderson could understand if he had ever seen Gloster Gladiators "shooting the works." J. H.

GYROSCOPIC CONTROL

Meredith and Cooke's Automatic Pilot

I PRESUME that Mr. J. Vivian Holman, in his letter to *Flight* of August 27th relating to "Gyroscopic Control," infers that Messrs. Meredith and Cooke are somewhat indebted to gyroscopes and, in particular, to the pioneer work of the Sperry Company in 1909 on gyroscopic stabilisation of aircraft. The possibility that they may have acquired a gyroscope through the medium of a toy-shop or Christmas tree must not be ruled out!

However, I do appreciate Mr. Holman's verifying Messrs. Meredith and Cooke's definite contribution to scientific progress relating to aircraft control, and accept his assurances that their invention in no way resembles the principle employed in the Sperry Automatic Pilot. It is also gratifying that Messrs. Meredith and Cooke's invention has received public, as well as Mr. Holman's, recognition.

I would also add to the interesting information given by Mr. Holman that Messrs. Meredith and Cooke's Automatic Pilot was tested and proved successful in 1925, whereas the use of the Sperry Automatic Pilot, fitted to the *Winnie Mae* was first made public at the conclusion of the late Mr. Wiley Post's historic flight in 1933. A. J. PAYNE.

ASTRO-NAVIGATION

Siderograph and G.M.T. Watch

COL. A. L. MIEVILLE'S letter in your issue of September 17th prompts me to ask if he has ever used the Longines "Siderograph." This is a very beautifully made instrument, produced, I think, in the U.S.A., though why it was ever given this name I do not know, for it produces no graph at all.

What it does do, however, is to show one, by means of hands on a dial, the exact value at any instant of G.H.A. Aries. I have used it, but for reasons which I will give later I do not like it.

It is, of course, rated to siderial time; it can be stopped and started at any time; it is heated to a constant temperature, and by means of a press button one can record the average G.H.A. Aries during the taking of a sight. No reference to an almanac is needed in the case of stars, but the practical navigator, having taken his sight, worked it out, and finally plotted it, must still refer to the much-despised G.M.T. rated watch. For it is no good plotting any position line of any sort unless the time in G.M.T. is put against it. So one might just as well start off in the first place by using the G.M.T. watch.

Grandpapa may not have used an Astrograph, but he could choose from more than two (or three) stars, and he did at least know what an Hour Angle was. A. C. LORAINE.

FUEL CONSERVATION

American Regenerative Scheme

YOUR correspondent, A. N. I., has drawn the attention of readers (*Flight*, September 10th) to the advantages of electric regeneration over the conventional power-dissipating schemes of testing engines, such as calibrated propellers, water-brakes, electric brakes and similar devices. A satisfactory scheme of regenerative testing should satisfy the following conditions:—

(1) It should accommodate a large range of engine sizes.

(2) It should be capable of driving the engine as well as absorbing power from it and must be capable of operating in either direction of rotation.

(3) It should be capable of transforming the rapidly fluctuating power of the engine into readily utilisable electric power. The electric power generated is most conveniently pumped into the supply mains; this means pumping electric power from a varying-speed source into a constant frequency system. A simple method of accomplishing this has been developed in the United States, as follows:

The scheme consists of a conventional synchronous machine, connected directly to the mains and coupled to the engine through a hydraulic clutch. With the clutch disengaged, the synchronous machine is brought up to speed and synchronised in the usual manner The clutch is now engaged, whereupon the synchronous machine, acting as a motor, starts the engine up. The engine is then brought up to a speed higher than the synchronous speed of the machine which, then acting as a generator, is loaded back on the power system—the machine running at synchronous speed owing to the slipping of the hydraulic coupling.

In order to load the engine below synchronous speed, the rotor of the synchronous machine may be locked by means of a brake; the engine power will now be dissipated in the hydraulic coupling. M. C. PHILIP.

CONTROL OF THE RUDDER

Why Not Rotate the Stick?

IS there any further justification for the continued existence of the rudder-bar on modern aircraft? It has always seemed to me to be somewhat Heath-Robinsonish and a survival of the days when not only did it take a considerable effort on the part of the pilot to work the rudder, but the problem of combining three separate movements in one control column proved too much for the technicians of those early days. It should, however, be quite practicable to overcome these difficulties now, especially with the various aerodynamical aids to rudder movement with which most aircraft are nowadays fitted.

The idea of turning the control column itself to actuate the rudder, in addition to its normal fore-and-aft and lateral movements, would seem to be particularly adaptable to the light cabin aircraft that is fitted with a wheel, or two segments of a wheel, for the aileron control. The "people's airplane" of the future, should it ever materialise, and should it not take the form of some kind of helicopter or autogiro, will, I think, almost certainly be fitted with this type of control. The ordinary or "moving stick" type of control column could be branched at the top, thus forming a "Y" shape, or it could be triangular, or fitted with a cross member to form a "T."

And while we are about it we may as well arrange matters so that the rudder control functions in what I might call a "natural" manner. That is to say, if, for example, with the new type of control I advocate, we wish to turn to the right, we will turn our wheel to the right and at the same time draw the right-hand side of the wheel towards us. It seems to me that such a movement would become "instinctive" to a learner in much less time than the present orthodox rudder-pedal method. Also, it would make for simplicity, the cockpit in the case of civil aeroplanes would look a lot neater, and in the case of service machines there would be a useful saving of space.

I am not a pilot, and it would be edifying to hear the opinions of experts on the subject. A. W. FELTON.

The Avro Lancaster at Dorval Airport, Montreal, after being flown across the Atlantic by Clyde Pangbourne. In the background is a Boston, a Liberator and a row of B.25 Mitchells.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

The London Gazette, September 4, 1942.

TECHNICAL BRANCH.

Air Cmdre. V. H. TAIT, O.B.E., to be Act. Air Vice Marshal. August 19, 1942.

The London Gazette, September 11, 1942.

Air Cmdre. (temp.) A. H. ORLEBAR, C.B.E., A.F.C., is granted the rank of Air Cmdre. (War substve.), July 22, 1942.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards:—

FOR BRAVERY and devotion to duty in air operations in the Western Desert:

BAR TO DISTINGUISHED SERVICE CROSS.

Sub. Lt. (A) R. E. BRADSHAW, D.S.C., R.N.
Temp. Sub. Lt. (A) B. F. SUTTON, D.S.C., R.N.V.R.

DISTINGUISHED SERVICE CROSS.

Temp. Sub. Lt. (A) A. BRUNT, R.N.V.R.
Temp. Sub. Lt. (A) S. L. REVETT, R.N.V.R.

MENTION IN DESPATCHES.

Temp. Sub. Lt. (A) M. A. GRAHAM, R.N.V.R.
Temp. Sub. Lt. (A) W. D. WALKER, R.N.V.R.
Ldg. Airman P. MCMAHON

FOR BRAVERY and sustained devotion to duty in many air operations from Malta:

DISTINGUISHED SERVICE CROSS.

Temp. Sub. Lt. (A) R. W. ELLIOTT, R.N.V.R.
Temp. Act. Sub-Lt. (A) J. A. CRAMP, R.N.V.R.

MENTION IN DESPATCHES.

Temp. Lt. (A) S. M. P. WALSH, R.N.V.R.
Temp. Lt. (A) W. D. WINTERBOTTOM, R.N.V.R.
Temp. Sub. Lt. (A) C. E. DAVISON, R.N.V.R.
Temp. Sub. Lt. (A) H. HORROCKS, R.N.V.R.
Temp. Sub. Lt. (A) W. G. A. SHEPHERD, R.N.V.R.
Temp. Act. Sub. Lt. (A) J. J. BROMFIELD, R.N.V.R.
Temp. Sub. Lt. (A) C. R. CASEY, R.N.V.R.
Temp. Act. Sub. Lt. (A) A. G. CROSS, R.N.V.R.
Temp Act. Sub. Lt. (A) D. J. HANSON, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Flt. Lt. D. A. G. Parry, No. 105 Squadron, who has been awarded a Bar to his D.F.C.

DISTINGUISHED SERVICE ORDER.

Wing Cdr. R. P. M. GIBBS, D.F.C., No. 50 Sqn.—This officer, who has achieved much success in torpedo bomber sorties, has displayed fine qualities of leadership, combined with exceptional skill. Throughout, his courage has been of a high order and has proved a source of inspiration to all.

Wing Cdr. W. E. SURPLICE, D.F.C., R.A.F.O., No. 226 Sqn.—On August 19th, 1942, Wing Cdr. Surplice and F/O. Rutherford were pilot and navigator respectively of the leading aircraft of a formation of bombers detailed to release smoke bombs to screen the landing of troops on the beaches near Dieppe. On the accuracy of this, the first smoke sortie, depended not only the success of the subsequent smoke-laying operations by following aircraft, but, in a great measure, the safety of the entire combined operation. Fully aware of the importance of his mission, Wing Cdr. Surplice, skilfully guided by F/O. Rutherford, flew in to the target at a low level and, defying an intense barrage from the unhampered ground defences, dropped his smoke bombs with precise accuracy. Both these officers displayed the highest standard of courage, skill and devotion to duty in the successful accomplishment of a most vital and dangerous task. Wing Cdr Surplice planned the details of all the smoke-laying operations allotted to the squadron.

BAR TO DISTINGUISHED FLYING CROSS.

Act. Wing Cdr. E. H. THOMAS, D.F.C., R.A.F.O.—Since being awarded the D.F.C., this officer has completed a large number of operational sorties. Throughout, his high qualities of leadership, combined with great courage and skill in the face of the enemy, have set a most inspiring example. He has destroyed at least four hostile aircraft.

Act. Sqn. Ldr. R. W. OXSPRING, D.F.C., No. 72 Sqn.—This squadron commander has rendered much valuable service. His skill, whether in attacks on the enemy's ground targets and shipping or in air combat, has been of a high order. He has destroyed at least seven enemy aircraft.

Act. Sqn. Ldr. J. S. KENNEDY, D.F.C., R.A.F.V.R., No. 226 Sqn. On July 19th, 1942, Sqn. Ldr. Kennedy and F/Os. Asker and Casey were pilot, navigator and wireless operator/air gunner respectively of the leading aircraft of a formation of bombers detailed to carry out an attack

A worms-eye view of the dorsal turret of a Liberator II. This is manned by the flight engineer. On the Liberator III the flight engineer's panel has been dispensed with and the instruments put on the pilot's panel.

in support of the combined operations at Dieppe. The formation was met with formidable anti-aircraft fire and Sqn. Ldr. Kennedy's aircraft was repeatedly hit, one engine being put out of action. F/O. Casey was wounded in both thighs, whilst his co-gunner was critically injured. In spite of this, Sqn Ldr. Kennedy, resolutely supported by the skilful navigation of F/O. Asker, led his formation over the town at low level and released his smoke bombs with precise accuracy on the target. Meanwhile, F/O. Casey, disregarding his injuries, engaged the enemy's defences whenever they came within reach of his guns. Sqn. Ldr. Kennedy eventually flew his damaged aircraft to base and landed safely. Throughout, this officer, gallantly supported by F/O.s Asker and Casey, displayed great courage, skill and determination.

DISTINGUISHED FLYING CROSS.

F/O. R. S. RUTHERFORD, R.N.Z.A.F., No. 226 Squn.—For citation see Wing Cdr Surplice.

Act. F/O. H. A. ASKER, D.F.M., No. 226 Sqn.

F/O. G. A. CASEY, R.C.A.F., No. 226 Sqn.—For citation, see Sqn. Ldr. Kennedy.

Sqn. Ldr. D. CARLSON, No. 154 Sqn.—This officer has completed a large number of operational sorties. He is a skilful and energetic squadron commander who, by his personal example, has raised the squadron to a high pitch of fighting efficiency. He has destroyed at least three enemy aircraft.

Act. Flt. Lt. J. WHITHAM, R.C.A.F., No. 401 (R.C.A.F.) Sqn.—This officer has completed a large number of sorties over enemy-occupied territory. He is an excellent flight commander whose fine fighting qualities have been well illustrated when leading his section in attacks on the enemy's targets. Besides his good work in the air, Flt. Lt. Whitham is a tireless worker on the ground and has proved a source of inspiration to all.

F/O. M. C. B. ANDERSON.—In August, 1942, this officer was engaged on a reconnaissance over Hamburg. Whilst over the target area his aircraft was subjected to much anti-aircraft fire, but, despite this, he made several runs over the objective and accomplished his task. In spite of attacks by enemy fighters on the return flight, he brought his aircraft safely back to base. This officer has performed much excellent work and has displayed courage, skill and devotion to duty.

F/O. G. W. H. REYNOLDS, R.A.F.V.R.—In addition to his other duties, this officer has completed numerous sorties in the Middle East against enemy reconnaissance aircraft flying at great altitudes. In one of these he engaged an enemy aircraft and probably caused its destruction. On four previous occasions he has damaged enemy aircraft. F/O. Reynolds has displayed a high standard of skill and devotion to duty.

F/O. D. T. SMITH, R.A.F.V.R., No. 226 Sqn.—On August 19th, 1942, this officer was the pilot of an aircraft detailed to lay a smoke screen along an area at Dieppe during the combined operations. In the face of intense opposition from the ground defences, F/O. Smith began his release run. When half-way over the target area a shell shattered the windscreen, wounding him in the face, and a piece of perspex became embedded in his right eye. Despite this, he bravely pressed on and completed his task successfully. On the return flight F/O. Smith's left eye also became affected by powdered perspex, causing him great discomfort, but he eventually flew his aircraft back to this country and made a safe landing. Throughout, this officer displayed the highest qualities of courage and resolution.

P/O. H. J. ARCHER, R.A.F.V.R., No. 88 Sqn.—In the combined operations on August 19th, 1942, P/O. Archer was the air-gunner of the leading aircraft of a formation of bombers detailed to attack a heavy battery position commanding the approaches to Dieppe harbour. When nearing the target the formation was intercepted by a force of enemy fighters. In the ensuing engagement, P/O. Archer maintained a running commentary of the progress of the combat and skilfully directed the defensive fire; with his own guns he probably destroyed a Fw.190. By his splendid fighting spirit and high skill this officer rendered most valuable service.

P/O. L. J. LONGHURST, No. 226 Sqn.—On August 19th, 1942, this officer was air gunner in an aircraft detailed to attack gun positions during the combined operations at Dieppe. Intensive anti-aircraft fire was encountered, which caused the destruction of the foresight of his guns. Despite this, he continued firing. Later, when withdrawing from the target, his aircraft was engaged by a Fw.190. As he was unable to sight his guns accurately, P/O. Longhurst coolly withheld his fire until the attacker was in close range; he then delivered a most effective burst at the enemy aircraft, which broke away, and when last seen was falling towards the sea with smoke pouring from it. This officer, who has completed 65 sorties, has invariably displayed skill, courage and resource in action.

P/O. G. PEPPER, R.A.F.V.R., No. 29 Sqn.—P/O. Pepper, as pilot, and Sgt. Toone, as observer, have been together in many night fighting operations. In August, 1942, they destroyed a Ju.88. Throughout their operations P/O. Pepper and Sgt. Toone have invariably displayed perfect teamwork and initiative.

Act. Flt. Lt. F. W. LISTER, R.A.F.V.A., No. 43 Sqn.—During the combined operations at Dieppe this officer skilfully led his section on four low level sorties against the enemy. On the first of these, his aircraft was badly damaged by enemy fire, but he flew it back to his base and executed a skilful landing. Throughout the operations, he set a splendid example. Flt. Lt. Lister has destroyed a Ju.88.

Act. Flt. Lt. J. E. WALKER, R.C.A.F., No. 81 Sqn.—This officer is a determined and skilful pilot. He has at all times shown a keen desire to engage the enemy. While serving in Russia, Flt. Lt. Walker destroyed one hostile aircraft. Since March, 1942, he has led his flight continuously in all its operations.

Flt. Sgt. J. W. Brooks, No. 174 Squadron, who has been awarded the D.F.M.

DISTINGUISHED FLYING MEDAL.

Sgt. (now P/O.) J. H. TOONE, No. 29 Sqn.—For citation see P/O. Pepper.

Flt. Sgt. K. L. MONAGHAN, No. 105 Sqn.

Sgt. A. W. DEAN, No. 105 Sqn.—In August, 1942, Flt. Sgt. Monaghan and Sgt. Dean were pilot and navigator respectively of an aircraft detailed to attack a target in Germany in daylight. Despite an unsettling experience which occurred before reaching the enemy coast, Flt. Sgt. Monaghan, assisted by the skilful and precise navigation of Sgt. Dean, reached the target area as planned. In the face of fierce opposing fire from the ground defences and in spite of the difficulties of approach, the target was bombed from an extremely low level. Throughout, both airmen displayed skill and courage of a high standard.

Sgt. JOHN BEECROFT, No. 101 Sqn.

Sgt. H. P. HANWELL, No. 101 Sqn.—Sgts. Beecroft and Hanwell, captain of aircraft and wireless operator/air-gunner respectively, have displayed resolute courage and initiative throughout their operational flying. On one occasion their example of fortitude in most harassing circumstances was in keeping with the highest traditions of the Service.

Sgt C. G. SCOTT, R.C.A.F., No. 418 Sqn.—This airman was the wireless operator/air-gunner of an aircraft detailed to attack a selected target prior to a landing by our combined forces at Dieppe. The bombing task was successfully accomplished, but on the return flight, whilst some three miles out to sea from Dieppe, the aircraft was attacked by a Fw.190. A burst of enemy fire raked the fuselage and set the starboard engine on fire.

Sgt. Scott's gun seat was shot from under him, but he fired a short burst at the attacker, although he was unable to observe its effect. The pilot's cockpit became filled with smoke and fumes, and the pilot himself was unable to see as he could not jettison the cockpit hood. The aircraft was forced down, and, on impact with the water, it broke in two by the rear gunner's compartment. Sgt. Scott was thrown into the water without his dinghy. The front portion of the bomber turned over and sank. The pilot and observer were still inside, but eventually both floated to the surface in an unconscious condition.

Sgt. Scott immediately swam to the assistance of his pilot, inflated his safety jacket, removed his dinghy, inflated it, and got the unconscious pilot safely aboard. Some 15 yards away the observer was struggling with the shroud of his parachute, which was around his neck and dragging his head under the water.

Sgt. Scott swam to his aid and freed him, but was unable to inflate his dinghy, as the fabric was torn. He therefore swam with the observer to the pilot's dinghy and managed to get him aboard. The dinghy was not large enough to hold three occupants, but, with complete disregard for his own safety, Sgt. Scott commenced swimming towards Dieppe. Fortunately, soon afterwards a friendly aircraft flew overhead. Anticipating that help would be forthcoming, he swam around, and about 50 minutes later both he and his comrades were rescued by a launch of the rescue service. In the face of extreme danger, this gallant airman displayed conspicuous courage and determination in his resolve to save his comrades, both of whom were injured and in great distress. Sgt. Scott also sustained a sprained ankle and a deep cut over the right eye.

Sgt. G. O. REYNISH, No. 33 Sqn. (since reported prisoner of war).—On the morning of May 14th, 1941, Maleme airfield, Crete, was attacked, with little warning, by 30 Me.109s. Sgt. Reynish, who was the pilot of one of the three Hurricanes which took off to engage the enemy, fought the entire enemy force single-handed for some time. He shot down two of the enemy aircraft before his own was set on fire. He succeeded in leaving by parachute and descended safely on to the sea, where he remained afloat for two hours before being rescued. Sgt. Reynish had no previous operational flying experience, since he had just arrived in the squadron from his training school. Undaunted by this experience, he showed great keenness to fly again immediately after his return to the station.

Sgt. F. A. M. SHOOTER, No. 38 Sqn.—Sgt. Shooter is employed as an air gunner. On every occasion, when given the opportunity to machine-gun ground objectives, he has done so with excellent results. His alertness in the turret has inspired his crew with confidence at all times. By his preparation and care for his guns and turret this airman has set an excellent example.

SERVICE

Roll of Honour

Casualty Communique No. 157.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. E. Bent; P/O. G. A. Bonner; Sgt. J. V. Brett; Sgt. H. Bridges; Sgt. L. Evans; Flt. Sgt. R. Griffiths; P/O. G. W. Guthrie; Sgt. J. D. Leicester; P/O. T. A. McCann; Sgt. J. A. McAuley; A/C.2 H. Marrison; Sgt. C. R. E. Meiklejohn; Act. Flt. Lt. D. Milne; W/O. R. J. Wallace.

WOUNDED OR INJURED IN ACTION.—Sgt. J. L. Cuninghame; Sgt. B. Edwards; F/O. M. E. Gardner; Sgt. R. G. Goodwin; P/O. R. M. Hoare; Sgt. R. J. Reynolds; Flt. Lt. C. H. Saunders; P/O. B. A. Taylor; Flt. Sgt. N. J. Warfield; P/O. J. Weber; Sgt. G. R. Webster.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. J. A. Cummings; Sgt. V. L. Wiles.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. E. Attemborough; P/O. J. S. Barrow; Sgt. W. Bell; Sgt. A. Charlton; Sgt. R. S. Coles; P/O. V. L. Currie; Flt. Sgt. W. Henderson; Flt. Sgt.

AVIATION

J. H. Hogg; Sgt. J. E. Jones; P/O. R. A. Malcolm; W/O. R. J. Male; P/O. W. J. Smith.

MISSING.—Sgt. K. J. Alexander; Sgt. G. C. Barrie; Sgt. W. J. Bartholomew; Sgt. E. W. Bond; Sgt. M. A. Brett; Sgt. W. G. Bunn; Act. Sqn. Ldr. F. De B. Collenette; Sgt. D. M. Davis; Sgt. F. K. Dennis; Sgt. J. W. Edwards; Sgt. D. Ellis; Sgt. T. A. Elliott; Flt. Sgt. S. C. Emerick; Sgt. D. Evans; Sgt. W. E. Furness; Sgt. A. F. Galley; Sgt. S. H. Greene; Sgt. P. Harrison; Sgt. J. D. R. Heddie; Sgt. G. L. Hodson; Sgt. H. Hole; Sgt. J. Holloway; Sgt. J. Hutcheson; Act. Flt. Lt. H. Jackson; Flt. Sgt. G. P. Jones, D.F.M.; Sgt. J. S. Kennedy; Flt. Lt. A. S. Malcolm; Sgt. R. G. Mercer; Act. Wing Cdr. A. R. Oakeshott, D.F.C.; Sgt. N. T. Owen; F/O. H. B. E. Phillips; Sqn. Ldr. A. N. Pirie; Sgt. T. S. Ross; Flt. Sgt. J. L. Salisbury; Sgt. G. A. Sargan; P/O. E. R. Senior; P/O. K. L. Sharp; Sgt. E. W. Spiller; Sgt. J. Tait; Sgt. N. Todd; Sgt. G. Towns; F/O. V. F. E. Treherne, D.F.M.; Sgt. J. N. Waddington; P/O. G. J. Waller; Sgt. C. V. Webb; F/O. A. S. Williams; Sgt. R. O. Williams; Sgt. R. Woollard; P/O. A. Ydlibi; Sgt. L. A. York.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. T. Dean; Sgt. C. E. Hayes; P/O. R. T. Meek; Sgt. J. E. Millar; P/O. R. H. Pike; L.A/C. L. Riches; Sgt. G. G. Scott; Flt. Lt. C. F. Turner; Flt. Sgt. B. J. D. Warde.

KILLED ON ACTIVE SERVICE.—A/C.2 E. C. Alton; Sgt. A. E. Barrows; Sgt. W. W. Berridge; Flt. Sgt. A. G. Cairns; Act. Flt. Lt. H. C. Campbell; Sgt. P. H. Campbell; L.A/C. L. A. Carter; P/O. B. H. Castelow; L.A/C. J. P. Clark; W/O. K. D. Davies; L.A/C. E. R. Delamere; P/O. W. H. Dingwall; Flt. Sgt. F. C. Ethell; L.A/C. Fricker; Sgt. W. A. Friendship; L.A/C. J. J. Gaitens; Sqn. Ldr. L. A. G. Howard; Sgt. N. B. Hyde; P/O. A. F. Jackson; Sgt. H. C. Jellyman; W/O. C. E. Lutwyche; Sgt. N. Macauliffe; Sgt. W. McDonald; Act. Sgt. R. W. Martin; Sgt. P. Mitchell; P/O. K. S. Norton; Sgt. D. C. Penwarden; Sgt. S. J. Plume, P/O. J. V. Robinson; A/C.2 C. Scales; Sgt. A. F. Sparham; Sgt. P. M. Stewart; Sgt. H. T. Swain; W/O. J. L. Smith; Sgt. M. E. Tuttle; P/O. W. C. Watterson; L.A/C. K. Whalley; L.A/C. M. R. E. A. R. Wingfield; Sgt. R. C. Wootton; A/C.2 A. T. Wray.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. G. J. Aldridge; A/C.2 A. G. Gibbs; Flt. Sgt. T. C. Keynes; Sgt. R. G. McCulloch; L.A/C. P. Smith; L.A/C. T. Taylor; L.A/C. R. J. Willis.

DIED ON ACTIVE SERVICE.—L.A/C. T. Benham; L.A/C. J. H. Beswick; A/C.1 R. J. Bonds; A/C.1 G. A. Broughton; A/C.2 C. J. Galloway; A/C.1 K. B. Gresham; A/C.2 E. C. Griffiths; A/C.1 E. D. Jarman; A/C.1 H. K. R. Jex; L.A/C. G. W. Lacey; A/C.1 J. Lindsay; W/O. D. Nixon-Stevenson; Sgt. M. S. Robinson; A/C.1 G. Rock; Cpl. D. Simpson; Flt. Sgt. C. E. Smith; Sgt. W. H. Taker; L.A/C. R. L. F. Tong; A/C.2 J. Trower; A/C.2 S. M. Varndell; A/C.2 E. J. Whitehead.

Women's Auxiliary Air Force

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—A/CW.2 F. E. Warth.

DIED ON ACTIVE SERVICE.—A/CW.1 M. H. Laidlaw; A/CW.2 M. Lazenby; A/CW.1 C. MacLeod.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. J. D. Newick.

WOUNDED OR INJURED IN ACTION.—P/O. T. E. Allen; F/O. D. H. Smith.

MISSING, BELIEVED KILLED IN ACTION.—P/O. H. W. C. Watts.

MISSING.—Sgt. D. R. Downing; Sgt. I. C. Dunn; Sgt. J. D. Hancocks; Sgt. H. H. Harris; Sgt. A. M. Johnston; Sgt. A. T. Little; Sgt. A. E. McCrae; Sgt. D. W. Spooner, D.F.M.; Sgt. W. J. Taylor; P/O. A. E. W. Webb; Sgt. A. F. Whittick.

Lending a hand in Malta. A soldier helps an R.A.F. corporal with minor repairs to the bomb door of a torpedo-carrying Beaufort.

KILLED ON ACTIVE SERVICE.—Sgt. R. R. Hinton.

DIED ON ACTIVE SERVICE.—Flt. Sgt. F. C. Cockman; Flt. Sgt. W. G. Lee.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt J. E. L. Downton; Sgt. O. F. Kelly; Sgt. J. M. McKerroll.

WOUNDED OR INJURED IN ACTION.—Act. Flt. Lt. J. F. Lambert; Sgt. J. F. Millar; Sgt. G. R. Poole; Flt. Sgt. J. M. Sanders; Sgt. J. N. Villeneuve.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. L. R. Moher.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. A. A. Carcarry; Flt. Sgt. F. G. Davidson; P/O. J. H. R. Paradis; Sgt. J. S. Peterson; P/O. J. F. Stokes; Flt. Sgt. C. A. Westwood; Flt Sgt. A. R. White; Sgt. J. D. Ritchie.

MISSING.—Flt. Sgt. J. S. G. Arundel; Sgt. J. E. Beckett; Flt. Sgt. J. V. Chicoine; P/O. G. G. Retallack; Sgt. W. G. Roddy; Sgt. A. L. Spafford; Sgt. R. W. Whytock.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. R. B. Henry.

KILLED ON ACTIVE SERVICE.—Sgt. K. McG. Byers; P/O. J. F. Haley; Sgt. D. G. Henderson; Sgt. G. R. Lewis; Sgt. T. B. McGee; Sgt. J. A. Riddell.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. L. M. Cameron.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. J. A. Brown.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. E. J. R. Yates.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. W. A. W. Sutcliffe.

MISSING.—Sgt. G. H. Butler-Williams; P/O. R. W. Morton; P/O. R. J. Smith; Sgt. F. S. Weaver.

KILLED ON ACTIVE SERVICE.—P/O. R. C. S. Beck; Sgt. K. G. Dunn; Flt. Sgt. M. W. Randall.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. K. H. Doherty.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. J. V. N. Nus; Lt. L. B. Van Der Spuy.

MISSING, BELIEVED KILLED IN ACTION.—Lt. F. J. Schofield.

MISSING.—Air Sgt. Geyer; Lt. F. J. Rusk; 2/Lt. J. Tzaitzis.

KILLED ON ACTIVE SERVICE.—2/Lt. R. T. Lambert.

DIED ON ACTIVE SERVICE.—Lt. L. J. Harper.

All in a day's work. R.A.F. drivers of the Middle East with children who had been evacuated by air from Malta.

Indian Air Force

KILLED IN ACTION.—F/O. D. C. Bhanjdeg; F/O. K. Mukejee.

Casualty Communique No. 158.

Royal Air Force

KILLED IN ACTION.—P/O. R. F. Atkins; Sgt. J. E. St. V. L. Beasley; Sgt. P. D. Rees.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. G. G. Machin; Sgt. C. B. A. Nichols.

MISSING.—P/O. A. A. Angel; Sgt. R. A. Ashmore; Flt. Sgt. D. A. Boldy; Sgt. N. E. Brace; P/O. L. E. Bradbury; Sgt. R. H. Brash; Sgt. W. J. Brazier; Flt. Sgt. P. E. Bull; Sgt. N. W. S. Cantwell; P/O. B. Challis; Sgt. W. J. Chapman; Sgt. L. H. Chessun; P/O. P. Copeland; Sgt. J. J. S. Corderoy; Flt. Sgt. J. W. Corfield, D.F.M.; Sgt. S. Coulson; Sgt. E. C. Craddock; Sgt. C. Craft; P/O. S. B. Critchison; Flt. Sgt. A. P. Cullerne; Sgt. S. A. Curtis; Sgt. G. Cutter; Sgt. A. W. Daniel; Sgt. H. R. H. De Laspee; Wing Cdr. F. W. Dixon-Wright, D.F.C.; Sgt. E. G. Dodd; Flt. Sgt. G. H. Duke; Sgt. C. H. Durrant; Flt. Sgt. B. A. Edmonds; F/O. S. R. Fairbairne-McPhee; Sgt. R. G. Fentrell; Sgt. S. A. Ferry; Flt. Lt. A. Fleming; Sqn. Ldr. F. C. G. Freeman; Sgt. A. J. Fromings; Sgt. J. C. Gilbert; P/O. L. R. Goad; Act. Flt. Lt. W. J. E. Hagger; Sgt. G. R. Halliwell; Sgt. A. Harkness; F/O. C. W. Harris; Sgt. K. H. Hart; Flt. Sgt. D. Hatton; Sgt. E. L. Hayward; Sgt. H. Hewetson; Sgt. A. S. Hoad; Sgt. W. E. Hudson; P/O. A. B. Houstoun; Sgt. S. H. Hughes; Flt. Sgt. A. M. Illingworth; Sgt. H. G. James; Sgt. J. S. Jarvis; Sgt. D. C. Johnson; Sgt. G. Johnston; Sgt. E. G. Kendall; P/O. J. H. Kinsey; Sgt. W. E. Konigkramer; Flt. Sgt. W. A. Lack; Sgt. J. M. Leahy; P/O. R. M. Lee; Sgt. E. Lister; Flt. Lt. J. T. C. Long; P/O. J. Lorkin; Flt Lt. D. T. M. Lumsden; Sgt. A. Lyle; Sgt. J. McCarten; Sgt. K. M. McGregor; Sgt. W. J. Mass; P/O. M. D'A. Mander; P/O. J. E. Marshall; Sgt. D. J. Miller; Sgt. D. A. Morris; Sgt. W. J. Mortimer; P/O. J. P. Muirhead; Sgt. R. A. Nayler; Sgt. F. Newbound; Sgt. D. D. Northfield; P/O. A. J. S. Ollar, D.F.M.; Sgt. P. J. D. Pearce; P/O. R. A. Petherbridge; Sgt. G. D. B. Raffill; Flt. Sgt. P. W. Raweliffe; Sgt. D. E. Raymond; P/O. W. Ross; Sgt. F. Routledge; Flt. Sgt. A. Rowland; Sgt. P. Roy; Sgt. E. A. Rudge, Sgt. J. A. Seabrook; Sgt. V. P. C. Sennett; Flt. Sgt. K. J. Shirley; Sgt. J. C. Skelton; F/O. J. Smith; Sgt. K. J. Smith; A/C.1 A. L. Sneath; Sgt. H. S. Stock; P/O. J. F. Stock; Sgt H. A. Storey; P/O. P. E. Stumbles; Sgt. W. A. Thompson; Sgt. G. Tomkins; Sgt. L. G. Trussell; Sgt. C. Waldron; P/O. F. W. Walker, D.F.C.; Sgt. W. Walton; Sgt. S. B. Ward; Sgt. J. S. Dardle; Sgt. L. E. Webster; P/O. H. H. Whitehead, D.F.M.; P/O. G. Whittaker, D.F.M.; Sgt. R. M. Wilkinson; Sgt. J. Wilson; P/O. W. H. Wood; Sgt. D. L. Worthington; Cpl. H. Wray; P/O. A. T. Yeo.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. P. R. Kember.

KILLED ON ACTIVE SERVICE.—Sgt. R. Collier; Sgt. G. A. Cooke; A/C.1 J. Davies; Sgt. H. S. Dunbar; L.A/C. H. Dutton; Sgt. K. A. Gleadall; Sgt. J. F. Heyman; A/C 1 F. C. Howard; Sgt. W. F. Jacobs; Sgt. H. C. Kent; Sgt. W. A. Lansley; P/O. C. H. Leonard; L.A/C. J. Murphy; Sgt. G. F. Studley; L.A/C. W. H. Symons; Sgt. I. G. Taylor; L.A/C. J. H. Taylor; Sgt. H. A. Thewles; A/C.1 F. S. Tysoe; Sgt. P. A. Webber; Sgt. G. H. Wynne.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. R. J. D. Christie; Sgt. B. W. Hubble;

SERVICE AVIATION

L.A/C. D. V. Johnson; Sgt. F. G. O'Flanagan; Sgt. E. T. Porter; A/C.1 H. T. Smith; L.A/C. G. D. Rees.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. G. H. Churchley; Act. Grp. Capt. G. J. Hanly.

DIED ON ACTIVE SERVICE.—A/C.2 D. Backhouse; Cpl. J. W. Bolton; A/C.1 L. A. Bolton; L.A/C. J. W. Johnson; L.A/C. W. A. Lishman; A/C.2 S. Milnes; L.A/C. I. J. Pritchard; A/C.2 W. T. Pullinger; L.A/C. R. Solomon; A/C.1 S. J. Thompson; A/C.1 J. E. Walden; A/C.1 C. Williams.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. D. Clelland; A/CW2. E. Glover.

Royal Australian Air Force

KILLED IN ACTION.—Sgt. R. A. Johns; Sgt. R. H. Kelly.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—P/O. H. G. Clarke.

MISSING.—P/O. C. E. T. Bartram; Sgt. D. Bell; Sgt. C. T. Bingham; Sgt. R. W. Brindley; Sgt. F. E. Channon; A/C.1 N. T. Cuddihy; Sgt. H. H. Fealy; P/O. E. F. H. Frith; Flt. Sgt. A. G. Grand; Sgt. A. M. Greenfield; Sgt. T. C. Hobgen; Sgt. A. W. Howard; L.A/C. C. L. Johnson; Sgt. C. R. D. Lowis; Sgt. A. D. MacLeod; P/O. A. R. Meaker; Sgt. J. R. Mullins; P/O. K. A. Murdoch; P/O. A. F. O'Dwyer; P/O. C. H. Phillips; Sgt. S. O. Simpson; Flt. Sgt. W. Stone; A/C.1 G. W. White; Sgt. R. A. Wilson.

KILLED ON ACTIVE SERVICE.—Sgt. C. J. Stuart.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. E. H. Ridler.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. G. T. Koellhoffer; Sgt. J. D. Luxton.

WOUNDED OR INJURED IN ACTION.—Sgt. R. V. Hawkes; P/O. S. J. W. Waller.

MISSING.—P/O. H. B. Barber; Sgt. P. W. B. Box; P/O. J. E. H. Emond; P/O. P. B. L. Evans; Sgt. A. J. Gerein; P/O. N. E. Gilboe; Sgt. M. T. Hammell; Sgt. T. J. Hannah; Sgt. H. F. Hasleden; Sgt. W. E. W. Holmes; Sgt. P. E. J. Howe; Sgt. W. M. Kostyshyn; Sgt. W. Kravac; Sgt. J. D. L. La Salle; Sgt. L. H. Latimer; Sgt. A. G. Lynds; Flt. Sgt. J. McCallum; Sgt. W. J. A. McLachlan; Sgt. J. A. McMahon; P/O. L. R. Maguire; Sgt. G. T. Morris; P/O. P. D. Mosher; Sgt. R. McA. Neil; Sgt. F. G. Price; P/O. D. R. Rehill; Flt. Sgt. G. S. Robb; Sgt. T. C. Robinson; Sgt. W. J. Smart; Sgt. J. A. Thompson; W/O A. C. Vantour; P/O. R. Woof.

KILLED ON ACTIVE SERVICE.—Sgt. F. J. H. Highmor; Sgt. D. B. St. J. Malcolm; Sgt. G. Navey; P/O. W. B. Sherry.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. V. E. R. Burtt.

Royal New Zealand Air Force

MISSING.—Sgt. A. R. Dally; Flt. Sgt. E. O. Johnson; Sgt. N. M. Langlands; P/O. J. J. N. McCarthy; Sgt. M. L. McLeod; Sgt. R. W. Vessey; Flt. Sgt. E. Waple; Sgt. C. L. Wood.

KILLED ON ACTIVE SERVICE.—Sgt. S. L. Portman; P/O. C. G. Russell.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. O. E. Amos; Sgt. D. W. Thompson.

South African Air Force

KILLED IN ACTION.—Lt. A. E. Corbey; Sgt. J. Forsyth; Sgt. A. N. Hutchinson.

Casualty Communiqué No. 159.

Royal Air Force

KILLED IN ACTION.—A/C.2 E. Barrett; Cpl. R. A. Brown; Sgt. W. ... Cock; Sgt. S. V. Davidge; Flt. Sgt. G. R. Douglas; P/O. C. W. Eames; P/O. L. J. Endicott; Sgt. W. Foster; P/O. G. R. Gethings; Sgt. J. Hartley; P/O. M. H. James; Sgt. D. Lee; Sgt. D. W. Lewis; W/O. W. G. Mewha; A/C.2 H. H. Nicholls; Sgt. J. K. W. Paul; Sgt. W. E. Powell; Sgt. J. W. E. Ross; Sgt. A. Squires; Sgt. G. F. Stephens; F/O. W. H. Thomlinson; Sgt. A. J. Thorburn.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. D. G. Robb; Sgt. R. J. Scott.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. Adcock; Sgt. R. K. Anson; Sgt. E. W. Armer; Sgt. R. A. P. V. Atkinson; Sgt. D. L. Bennett; Sgt. C. Broad; Sgt. S. M. Cashman; F/O. R. W. Cooper; Sgt. J. Crawford; Sgt. M. J. C. Cross; Sgt. G. W. Dalby; Sqn. Ldr. C. F. Darbishire; Sgt. K. A. Davis; Sgt. D. A. Ferguson; Sgt. C. T. Fletcher; Sgt. W. F. G. Fletcher; Sgt. R. Holt; Sgt. G. P. Hughes; F/O H. J. Jeffcoat; Sgt. J. E. Kitley; Sgt. L. D. Leggett; Sgt. D. McLaren; Sgt. L. J. Macey; Sgt. N. Maddox; Wing Cdr. S. T. Misselbrook, D.S.O.; Sgt. J. T. H. Mowat; Sgt. T. J. Pearce; Sgt. R. J. Pulham; Sgt. J. V. Randall; Sgt. A. H. Taylor; Sgt. C. Townend; Sgt. R. Turner; P/O. L. G. R. Wallington; Sgt. J. C. B. Webster; Sgt. F. A. White; Sgt. J. Wiliamson; Flt. Sgt. J. Wilson.

WOUNDED OR INJURED IN ACTION.—Sgt. H. Carness; Sgt. H. Gallaher; P/O. R. J. G. Green; Act. Sqn. Ldr. J. P. Winfield.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. A. C. Moore; Sgt. W. H. Parsons.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. W. Y. Alderdice; Sgt. E. Annable; P/O. L. A. Coventry; Sgt. W. H. Curtis; Sgt. I. Edwards; Sgt. D. H. Fletcher; Sgt. A. Flower; Flt. Sgt. R. J. Flux, D.F.M.; Sgt. J. R. Frehner; Sgt. J. Garroway; Sgt. P. W. G. Hall; Sgt. T. Hindle; Sgt. D. L. Hughes; Sgt. G. H. Jackson; P/O. R. M. Owen; Sgt. C. J. Scott; Sgt. H. L. Smith; Sgt. H. H. Stott; Sgt. D. S. B. Vincent; P/O. J. J. Walker; P/O. A. C. White; Sgt. D. B. Williams.

MISSING.—Sgt. W. J. Aitken; Sgt. H. J. Bennett; P/O. K. J. Broderick; P/O. W. G. Campbell; P/O. P. C. Coulthard; P/O. C. Cresswell; Flt. Lt. R. D. Crofton; Sgt. B. Curran; Sgt. J. C. Dennis; Sgt. A. S. Douglas; Sgt. I. Edwards; Wing Cdr. J. Fulton, D.F.C., A.F.C.; F/O. T. A. Gabe; Flt. Sgt. D. Gilligan; Sgt. J. Harvey; Sgt. S. E. Hunt; Sgt. A. M. Hunter; Sgt. W. M. James; Sgt. D. E. Jones; P/O. W. S. King; Sgt. O. F. Lodge; Flt. Sgt. G. B. Luckmanoff, D.F.M.; Sgt. F. L. Luff; Sgt. H. M. McHare; Sgt. J. R. Martin; Sgt. A. D. Meech; Sgt. J. A. Nelson; Sgt. E. S. Normore; Sgt. H. P. O'Dell; Sgt. W. D. Palmer; Sgt. A. G. Parrott; Sgt. W. L. S. Rees; Sgt. J. G. Reid; Flt. Lt. V. A. Ricketts, D.F.C.; Sgt. S. A. Roberts; Sgt. T. K. Robinson; Sgt. G. Scully; P/O. T. G. Shaw; Flt. Sgt. I. R. Snape; Sgt. R. S. Shorthouse; Wing Cdr. M. J. C. Stanley; Sgt. J. G. Strachan; Flt. Sgt. D. V. Thesiger; Sgt. J. Thomas; Sgt. L. G. L. Ward; P/O. D. A. Welch; P/O. W. G. J. Woodmason.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. L. G. Cartmell; Sgt. G. M. R. Fairweather; L.A/C. T. E. U. Garbutt; L.A/C. A. Glossop.

KILLED ON ACTIVE SERVICE.—Sgt. P. A. Beavis; Flt. Sgt. J. R. Boiston; Flt. Sgt. B. W. Bowman; F/O. J. W. I. Botting; L.A/C. F. J. Brand; P/O. G. C. Buxton; A/C.1 W. Cant; Sgt. A. R. Catt; P/O. A. G. Clark; L.A/C. S. Cooper; Cpl. A. Dale; Sgt. K. Fairfoull; Flt. Sgt. C. E. Forrest; Flt. Lt. F. M-K. Goyen; L.A/C. D. M. Gross; L.A/C. J. W. Hales; A/C.2 B. A. Hannah; Sgt. J. W. Jessett; Flt. Sgt. W. R. Jones; Air Comdre. H.R.H. Duke of Kent, K.G., K.T., G.C.M.G., G.C.V.O.; Flt. Sgt. C. N. Lewis; P/O. P. S. Morris; Wing Cdr. T. L. Moseley; Flt. Sgt. E. J. Newerdine; W/O. H. Robinson; W/O. L. C. Salter; P/O. G. R. Saunders; F/O. G. E. C. Seale; Cpl. R. B. Snashall; Sgt. L. E. Sweet; Sgt. F. Walton; Flt. Sgt. W. H. Weller; Flt. Sgt. D. J. Williams.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. A. S. W. Jack; Sgt. D. S. Southern; Sgt. L. B. Williams.

DIED ON ACTIVE SERVICE.—Cpl. T. A. Andrews; A/C.2 D. Brooker; Cpl. A. J. Doherty; L.A/C. S. J. Fairclough; A/C.2 I. T. H. Hall; A/C.1 G. L. Nunn; L.A/C. C. L. Simmons.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. G. M. Gee.

Two General Aircraft Hotspur gliders in formation after dropping their tow lines from Miles Master tugs. Position is kept by using the flaps as reversed throttles.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. F. F. Clowry; P/O. W. K. Hayne.

WOUNDED OR INJURED IN ACTION.—Sgt. H. B. Hansen.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. A. Williams.

MISSING.—Sgt. S. K. Annesley; Sgt. E. D. Brabender; Sgt. K. E. Dare; Sgt. J. Power; Sgt. A. T. A. Wallis.

KILLED ON ACTIVE SERVICE.—Sgt. J. A. Ahern; Sgt. R. G. Daniel; Sgt. J. F. Elliott; Act. Sgt. G. R. Gosden; Act. Sgt. M. C. Haynes; Sgt. N. G. Peters; P/O. S. W. Smith.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. M. Bloomfield; Sgt. R. M. Ennis; Sgt. J. H. Labelle; Flt. Sgt. N. Lefuly; Act. W/O. B. D. R. McComb; Sgt. C. A. Manchur; Flt. Sgt. F. N. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. H. Pick; Flt. Sgt. M. M. Waite.

WOUNDED OR INJURED IN ACTION.—P/O. L. O. H. Boucher; Sgt. R. B. Dion; Sgt. G. H. Lancaster; Sgt. N. E. McKee; P/O. L. W. Somers.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. J. Dillon; Sgt. R. L. Gordon; Flt. Sgt. S. O. Hill; Sgt. E. C. L. Jones; Flt. Sgt. D. H. McAlpine; Flt. Sgt. D. R. McKinnon; Flt. Sgt. J. A. E. Romas; P/O. L. E. Swatridge; Sgt. J. B. Waddel.

MISSING.—P/O. N. G. Arthur; Flt. Sgt. E. Bradley; Sgt. H. Bryden; Grp. Capt. H. R. Carefoot; F/O. G. Carlet; P/O. H. J. Dell; Sgt. R. W. Dreyer; Flt. Sgt. F. A. Duff; Flt. Sgt. H. H. Harrison; Act. Flt. Lt. G. P. Hughes; P/O. R. P. Locke; Flt. Sgt. E. F. Monroe; Act. W/O. C. B. Ramsay; Sgt. B. W. Reynolds; Flt. Sgt. J. W. Sanderson; Flt. Lt. J. R. C. Tyre; Flt. Sgt. R. W. Woolner; Sgt. R. E. Wylie.

KILLED ON ACTIVE SERVICE.—P/O. W. R. McDunnough; Sgt. W. L. McGinn; Sgt. H. J. Miller; P/O. M. Strutt.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. V. E. Reynolds.

Royal New Zealand Air Force

KILLED IN ACTION.—Sgt. R. J. L. Jones; Sgt. R. S. Sykes.

MISSING.—Sgt. W. J. Brandon; Sgt. J. D. Gould; Sgt. R. J. F. Hirst; F/O. E. M. Innes-Jones; Flt. Sgt. P. D. Lowther; Sgt. R. E. Sharp; Sgt. J. C. Wilmshurst.

KILLED ON ACTIVE SERVICE.—Sgt. E. F. Blacklock.

South African Air Force

MISSING.—2/Lt. L. W. Rapp; Lt. W. F. Powell.

Indian Air Force

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. Nasiruddin; P/O. G. Sequiera.